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ENGINEERING & MANAGEMENT

(Oman Vision 2020: Opportunities & Challenges)

24-25 February, 2016

PROCEEDINGS

Organizing Secretary
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Coordinator
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His Majesty Sultan Qaboos Bin Said
H.E. Dr. Omar Bin Abdul Muniem Al Zawawi
Founder, Waljat College of Applied Sciences, Sultanate of Oman
PREFACE

To succeed in today’s global market place there is an increasing need of proactively leading innovations in various fields and functioning in a firm such as working as a team for the accomplishments of organization goals. It involves coming up with new ideas, techniques or even products, building an understanding for the same through scientific research, finding the bests ways in which it can be adapted in today’s business environment and identifying scope for further study in its developments.

To provide a vibrant forum to present these thoughts and discuss how their implementations, Waljat College of Applied sciences, Muscat in Collaboration with Birla Institute of Technology, Ranchi (India) organized an International Conclave on Innovations in Engineering and Management, held on Feb 24-25, 2016 aiming to focus that examined issues, challenges in the Engineering and Management.

The conclave is an approach to get Corporate Professionals, Academicians, Research Scholars and Students together in a single platform for in-depth discussions on the critical themes in the areas of Management and Applied Sciences particularly in the fields of Computer Sciences & Information Technology, and Electrics & Communications with sub theme of Contemporary Issues on Oman perspective. We are also organizing Business Plan Competition, Case Study Competition and Technical Project for WCAS students and other HEI’s students.

ICIEM - 2016 will concentrate on numerous topics of the same by the realistic revelation in the form of dedicated sessions, group discussions and distinguished speeches from the foremost Academicians.

The tremendous response have been received from the large community of Academia’s, IT Professionals, Policy Makers, Research Scholars from 10 countries have been extremely encouraging and rewarding.

More than 180 abstracts were received and more than 95 papers were received. All the papers were checked through turnitin software and also were peer reviewed and finally 69 papers were selected to be included in the proceedings. Authors were requested to come for oral presentation. A panel discussion by eminent Academicians on the theme was held to formulate final recommendations and to sum up the event. These papers encompass information’s from different domains that are of interest to a wide spectrum of readers. It is hoped the proceeding will provide valuable information that proves useful in policy and decision making, improvement in teaching and learning practices, enhancement of research capabilities and technological development in various spheres of advanced studies.

We are grateful to H.E. Dr Omar bin Abdul Muniem Al Zawawi, Founder of WCAS for his continued support, encouragement and guidance in all our endeavors. We also wish to record our appreciation and gratitude to leading sponsors who have helped this Conclave a grand success. Further, we express our grateful thanks to Prof. (Dr.) Manoj Kumar Mishra, Vice-Chancellor, Birla Institute of Technology, Ranchi (India) for his patronage and advice. We also wish to thank
Hon’ble Dr. Zuhoor Abdullah Salim Al-Khanjari, Chairperson of the Trustee Council WCAS and other members of Trustee Council for their involvement and guidance from time to time to make this event a grant success. Our sincere thanks is due to all sponsors, media representatives, volunteers and others who contributed immensely in the conclave.

The distinguished delegates who came from different countries to participate in the conclave deserve to be highly complimented and their rich contributions were truly valuable. Without their contribution, the conclave would not have been achieved.

Last but not the least, we would like to place on record our indebtedness to the support and whole-hearted help proved by the various members of the organizing committees, individual faculty members and the staff of WCAS during the entire course of the event. We will also like to acknowledge and express our gratitude to esteemed reviewers and editorial board members.

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Dean, WCAS
&
Organizing Secretary
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VIRTUALIZATION OF SERVER ARCHITECTURE FOR GREEN IT ENVIRONMENT

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ABSTRACT
There are several components required to establish green IT environment. These typically include front end platform used by the user, back end platforms such as server and storage, a cloud based delivery, and a network. The approaches to green IT could be applied to individual component or organizational level. In particular, the important approach is to move to server virtualization, cloud computing and software as a service where appropriate. Virtualization can assist in distributing work so that servers are either busy or put in a low-power sleep state. In this paper novel server architecture is proposed that could be used as platform virtualization. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. The proposed study suggest that virtualization helps to reduce lower power and cooling consumption, by reducing the number of machines and server it needs. The proposed architecture helps to create an environmentally sustainable computing effectively.

Keywords: Cloud Computing; Green IT; Multiprocessor; Interconnection Network; Server; Virtual Machine.

1. INTRODUCTION
Green IT is a set of practical measures designed to ensure that Information Technology is developed, delivered and used in a way that is environmentally friendly, sustainable and energy efficient. Modern IT systems rely upon a complicated mix of people, networks, and hardware. Therefore, a green computing initiative must cover all of these areas as well. A solution may also need to address end user satisfaction, management restructuring, and regulatory compliance [1].

Computer virtualization refers to the abstraction of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. Virtualization can assist in distributing work on the virtual machines thereby reducing the power consumption [2]. Several commercial companies and open-source projects now offer software packages to enable a transition to virtual computing. For example Intel Corporation have also built proprietary virtualization enhancements to the x86 instruction set into each of their CPU product lines, in order to facilitate virtual computing [3], [4], [5].

The internet in the recent year has shown increasing demand of sophisticated network infrastructure and increased bandwidth. A typical structure of general cloud architecture which essentially supports green IT contains massive collection of servers which may be either real or virtual. The main task of a server or router is packet forwarding over the internet. The continuously increasing numbers of routers over the internet and increasing multimedia applications have caused network traffic to grow rapidly. On the other hand, researchers are paying great deal of attention to server development to cope with the current demand that requires high speed packet forwarding to overcome increasing network delay. Virtualization is the key mechanism that could be used the server utilization as much the computing power available to the server. For better match the overall work load, multiprocessor approach to parallelism is the most generalized and flexible one. However, the success of this approach depend how effective the architecture is, what mechanism is used to manage the resources available on the servers when used in cloud computing environment.

In parallel, the notion of Grid or parallel architectures emerged as a metaphor for a distributed network that can offer resources depending on the users’ needs. Many different interconnection networks have been used in commercially available concurrent systems and numerous research prototypes have been proposed and evaluated in the literature [6], [7], [8]. Prime examples are found in ring network, hypercube, debruijn network, Linearly Extensible Tree (LET) network. Based on the study of above architectures we first outline the characteristics, promise and benefits associated with Cloud Computing in green IT and discuss the deployment and delivery approaches, as well as the inherent issues and challenges.
The rest of the paper is organized into five sections. Section 1 is the introduction. Section 2 is an overview of the cloud architecture which encompasses the concept of green IT, while section 3 describes the proposed server architecture in detail. The comparative study of the proposed architecture with other similar architectures is discussed in section 4. Section 5 concludes the paper with a remark of future work.

2. CLOUD ARCHITECTURE

Cloud computing brings benefits in terms of reduce IT cost. The measure benefits are in terms of economical, architectural and strategic. A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers. Cloud computing is an emerging technology that support business, applications by utilizing different data sources and servers available at different sites. Several taxonomy of the cloud computing have been reported [9], [10], [11], [12]. The most general architecture based on cloud services is the layered architecture shown in Figure 1. These services are available on the cloud and accessible anywhere across the globe. However, users may have single point of view from the cloud services by running applications in shared environment. Cloud architecture addresses the key difficulties while forming the virtual system. A cloud can further be classified as public, private, community and hybrid based on model of development [15, 16]. Public cloud uses resources from anywhere in the world whereas private cloud take the services of the infrastructure maintained on a private network. A hybrid cloud is a mixture of private and public cloud. In hybrid cloud a private cloud is supplemented with the computing capacity from public cloud.

![Figure 1. Layered Architecture of Cloud](image)

In each type of cloud services the coupling between hardware and software is an integral part of cloud based computing applications. Cloud computing system must adopt the highly sophisticated and up-to-date tools for better services to the user.

3. THE PROPOSED SYSTEM MODEL

Since the development of multiprocessor system the software design approaches has struggling to cope up the sequential nature of most of the program execution. In this section a new architecture has been discussed thoroughly along with the parallel algorithm. The proposed LEC server may be defined through connection functions in a manner similar to that of the cube connection. LEC network grows linearly in a cube like shape. Let S be a set of N identical processors, represented as

\[ S = \{P_0, P_1, P_2, \ldots, P_{N-1}\} \]

The number of processors N in the network, at a level n is given by \( N=2^n \), where n is an integer and greater than zero. For different levels, networks having 2, 4, 6, 8, 10… processors are possible.

In order to define the link functions we denote each processor in the set \( S \) as \( P_{in} \), \( n \) being the level in network where the processor \( P_i \) resides. As per extension policy, only two processors exist at level \( n \). Thus at level 0, \( P_0 \) and \( P_1 \) exist and at level 1, \( P_2 \) and \( P_3 \) exist and so on.

Let \( s \) be the set of designated processors of \( S \), thus

\[ s = \{P_i\}, \quad 0 <= i <= N-1 \]

The link function \( L_1 \) and \( L_2 \) define the mapping from \( s \) to \( S \) as

\[ L_1(P_i) = P_{(i+1)} \mod N \]
L_2 (P_i) = P_{(i+2)} \text{ mod } N, \text{ for all } P_i \text{ in } s

The two functions L_1 and L_2 indicate the links between various processors in the network. The LEC server with six nodes is shown in Figure 2.

![Figure 2. A six processor LEC server](image)

The various properties of the proposed server are listed below that help to understand the effectiveness of a particular organization. These are:

- **Number of Nodes (N):** The number of nodes in a multiprocessor network plays an important role to evaluate the cost of a multiprocessor system. Lesser the number of nodes results lesser complexity and ultimately economical. The LEC posses a constant number of nodes.

- **Diameter (D):** The diameter of a network is the measure of the maximum inter-node distance in the network. Low diameter is better, because it determines the distance involved in communication and hence the performance of multiprocessor systems. It may be highlighted that the diameter of LEC shows a lesser value in comparison to other networks.

- **Degree (d):** The degree or connectivity of a node in a network is defined as the number of connections required at each node. The degree of node in the proposed architecture is always 4. The constant node degree is better to keep the architecture simple and economical.

- **Extensibility:** In the proposed network, the extension complexity increases in a constant manner because each extension requires single layer of 2 nodes. Besides, the LEC network can be extended in two directions, vertically upward and vertically downward.

- **Bisection Width (b):** The bisection width of a network is the minimum number of edges that must be removed in order to divide the network into two halves. The LEC has a bisection width equal to N.

- **Cost (C):** It is defined as the product of the diameter and the degree of the node for a symmetric network. (i.e. Cost = D*d). This factor is widely used in performance evaluation.

- **Fault Tolerance:** Green computing is an emerging computing service paradigm. There are fears, uncertainties and concerns about the technology’s maturity. However, the most important can be listed as those relating to: design, manufacturing, using and disposing of computers and subsystems. As more and more processors are incorporated into the network, the complexity of the design increases. In the presence of a fault in such complex system, it is required that all the active processors should remain as a connected component and be able to undertake part in significant parallel computation. In the proposed network the bisection width is directly proportional to the number of processors available in the network. Therefore, the proposed LEC network has better capability of fault tolerance and any single faulty node or any single faulty link can be bypassed by only two additional hops.

Green IT and its services present opportunities to deliver low carbon footprints and reduce carbon emissions because of the ability to make energy consumption and green house gas emissions visible through its products and services. There are various approaches to actually reduce the energy consumption of network devices by proper network/device management techniques. Many corporate IT developers have green computing initiative to reduce the environment impact of their IT operations [2], [14]. Forming a cloud for such environment is similar to parallel computing in the sense that it also employs distributed resources to satisfy customer needs or to achieve application level objectives. However, cloud computing take the advantage of virtualization technologies at multiple levels to realize resource sharing and dynamic resource provisioning. Multiple Virtual Machines can be started and stopped on-demand on a single physical machine to meet accepted service requests [12], [13]. Therefore, providing
maximum flexibility to configure various partitions of resources on the same physical machine to different specific requirements is a vital issue.

In addition, multiple Virtual Machines can concurrently run applications based on different operating system environments on a single physical machine. This is because every Virtual Machine is completely isolated from one another on the same physical machine as shown in Figure 3.

![Figure 3. Virtualization of Resources](image)

4. COMPARATIVE STUDY

To draw general conclusion about the effectiveness of the proposed server, it has been tested to manage the artificial load dynamically. The Allocation Service determines dynamically how to schedule a new arrival at the execution node. For simplicity, we implement the same time slot selection policy for the allocation service at every execution node. Similarly the tasks are independent and any task can be executed on any node on the network. The same algorithm has been applied on various other similar multiprocessor networks under the same environment. The simulation run consists of generating artificial uniform load and mapping them on the six processors Linearly Extensible Tree (LET), six processors LEC and eight processors hypercube networks. The estimation of load imbalance is obtained for various stages of the tasks structures and the curves are plotted as the average percent imbalance against the load for different stages shown in Figure 4 and 5.

![Figure 4. Simulation of load on various multiprocessor networks](image)

![Figure 5. Simulation of load on various multiprocessor networks](image)

The trends of curves obtained in Figure 4 and 5 indicate the behaviors of the load imbalance value with respect to the load at various stages on various multiprocessors networks for uniform as well as non-uniform task structures. Non-uniform means the tasks are generated in an unpredictable way and managed dynamically by the proposed system. It is clear from the curves that initially the value of imbalance starts from zero and reaches to its maximum value for all the multiprocessor networks. This high value of imbalance is due to lesser numbers of tasks available in the earlier stages of load. When sufficient numbers of tasks are available a lesser value of imbalance is obtained. Therefore, a good balancing is achieved when more numbers of tasks are available. The reason for better utilization of the nodes is the connectivity of different nodes in the system as it has a meshed topology with lesser diameter. The trend shown in the curve indicates that the proposed network when used as a server in the virtual computing environment is performing equally well while managing the load dynamically for both uniform and non-uniform task type structures.
5. CONCLUSION AND FUTURE WORK

Green IT is an emerging computing paradigm which promises to provide opportunities for delivering computing services in a way that have not been experienced before. The objective is to use the system in efficiently and effectively with minimal or no impact on the environment. Virtual computing is a set of practical measures designed to ensure that Information Technology is developed, delivered and used in a way that is environmentally friendly, sustainable and energy efficient.

We presented a virtual multiprocessor system with appropriate interconnection and other desirable properties. The motivation of the proposed LEC server relies on this context, and attempts to see how the server design can benefit from the architectural innovations. Effort is on to investigate how to exploit a multiprocessor architecture with lesser number of nodes. The proposed architecture may provide one of the important resource to an entire HaaS backend. The proposed server dynamically manages all the nodes available in the network. The system can host a number of virtual machines. The virtualized machine can be used to run existing applications in parallel without worrying about the operating system, server hardware and load balancing or computing efficiency.

In this paper, we argue that concerns about the design of a hardware cloud computing platform that enables IaaS services at users end. By using the concept of virtualization in the proposed model improved computing environment can be dynamically created, expanded or moved to different platforms as the demand varies. The proposed model could be used to enhance business values at reduce cost. We plan to implement a fully functional prototype based on our design and evaluate its performance in the near future by a number of factors, such as communication delays, imbalance of load among the nodes and scheduling overheads. The proposed architecture is linearly extensible multiprocessor type systems in general and can be considered as low cost multiprocessor server in terms of better network utilization in green computing environment.

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POTENTIALS OF OPEN EDUCATIONAL RESOURCES LEARNING ENVIRONMENT AND EDUCATIONAL DATA MINING: THE CASE OF HCT STUDENTS IN MASTERING SELECTED SKILLS IN PROBABILITY

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ABSTRACT

Educational data mining (EDM) is a relatively a growing research community that has been widely use in discovering novel and potentially useful information from large amount of data acquired from different data resources. This paper focuses on advocating an Open Educational Resources (OER) learning environment and showing its impact using the EDM tools. There are significant numbers of scientific articles which serves as evidence how progressive and promising results can be in utilizing EDM and currently, there is an overwhelming interest to its application in higher education institutions. This paper manages to explore the potentials of EDM by integrating an adaptive web-based tutoring system in supplementing the instruction of mastering skills in probability. In addition, it manages to look at the changes in students’ attitude towards this kind of teaching methodology. A total of 43 students participated in this study and data was gathered from different resources like the pre-test, post-test, e-learning information logs and questionnaire checklist. Majority of the students who completed the survey perceived positive gains in their student’s excitement, improved skills mastery in probability and were overall satisfied with the methodology. A predictive model was also built via forward logistic regression and found to have accuracy higher than the constant model. Results showed that students achieved skills mastery faster than expected and within the acceptable parameter using the predictive model.

Keywords: Educational Data Mining, Open Educational Resources, Skills Mastery

1. INTRODUCTION

Educational Data Mining (EDM) is concerned with finding new patterns in large amounts of students learning and assessment data. This mining discipline originated on the concept that big data on educational setting contains unique characteristics as compared to other minable data sources. But first and foremost, EDM will need data, maybe structured or unstructured, to begin with. Traditional learning environment are known to be a good source of structured data but are ‘significantly’ limited in its ‘mineability’ to potentially give a general attribute to student’s learning attitude and performance. The limitation in ‘mineable’ educational data is addressed by this paper by introducing an Open Educational Resources (OER) learning environment. This environment is new at least in the setting of the study but provides a great potential to extend a limited class hours, to replace expensive primary resources (e.g. books, etc..) and to explore undiversified teaching methodology. This paper presents how using data mining algorithms can extract pedagogically relevant knowledge hiding in an OER learning environment.

The next section of this paper presents the background of the study; the research methodology used in the study was explored in Section 3 while the results of the analysis and conclusion were discussed at the later Sections.

2. II. BACKGROUND OF THE STUDY

There were two things to be discussed in the background of this study. First, Open Educational Resources and its impact in teaching and learning. Secondly, data mining in general and Educational data mining in specific.

a. Opportunity of using Open Educational Resources (OER)

Open Educational Researches (OER) is a prosperous area aimed at giving community equal access to knowledge, relevant and rigorous educational resources and innovative educational opportunities. OER facilitate teaching and learning from many aspects. The great variety of Open Educational Resources which facilitate teaching and learning, allowed the chance of differentiated instruction so as to cater for students individual capabilities. Students’ assessment area was one of the OER focus. Learner assessment will be shaped differently in OER concepts. Collecting feedback through smart, interactive software would facilitate the analysis of students’ results. Teacher’s efforts in marking and analysing students’ performance will be reduced.
OER played a big role toward student centre approach where the teacher would act as a facilitator while the learner would be acting and reacting to a rich learning environment where the technology will play an important role. There are many researcher studied the impact of OER in courses design, teaching, learning and assessment. Many of these researches focused on how OER will provide new opportunities to be able to access educational resources and eliminate the need to purchase expensive reference materials such as Bilsett. Al. (Bliss, Robinson, Hilton & Wiley, 2013). Caswell (2012) study which was an initiative to redesign their curriculum was undertaken by the Washington State Board of Community and Technical Colleges to leverage OER and original, faculty-authored content. In this way, the faculty will be able to use OER in order to replace traditional textbooks and will dramatically lower the cost of education.

b. Overview of Data mining in Education

The field of Data Mining is concerned with extracting new knowledge from large amounts of data. The process of tracking and mining student data in order to enhance teaching and learning is relatively recent but there are already a number of studies trying to do so and researchers are starting to merge their ideas [1].

There are many research shows the impact of data mining approach in education. Gueraud, V. & J.-M [2] use pedagogical scenarios to control interactive learning objects. Records are used to build charts that show exactly where each student is in the learning sequence, thus offering to the tutor distant monitoring. Duval et. al [3] in their research recorded students’ answers to exercises. Simple queries allow to show charts to teachers/tutors of all students with the exercises they have attempted, they have successfully solved, making tutors aware of how students progress through the course. Minaei-Bidgoli and his colleges [4] use classification techniques to predict student performance fairly accurately by using features extracted from log data and marks obtained in the final exam. Such data can allow tutors to identify students at risk and could help in personalize the teaching and provide advice head of the final exam. In this research we were inspired by Minaei-Bidgoli and his college [4] research. It helped us to identify the impact of OER in identifying students’ level of knowledge and predict the possibilities of failure.

3. METHODOLOGY

Researchers used combination research approaches-quantitative and qualitative, and different tools. Therefore, a satisfactory data can be generated to inform the research questions in the study. During the investigation of any educational setting, focus of interest is an important aspect (Pears et. al, 2004). It explains what happen in the course context that the research aims to investigate.

![Figure 2: A Screen Grab of the Actual Dedicated E-learning Course Webpage](image)

The goals of this study are to establish of an Open Educational Resources learning environment and introduce educational data mining in predicting student course outcome. To achieve these goals, a course in Probability has been purposively chosen to be used in the study. Several probability skills are included in the duration of the exposure to OER learning environment (1) including probability of an event, finding probability of compound events using (2) addition rule and (3) multiplication, (4) combination and permutation (5) finding the probabilities using standard normal distribution (6) finding probabilities using binomial distribution (7)
finding probabilities using two-way table. The course is offered by the Mathematics Section of IT Department. The course consists of two sections with a total of 58 registered students. Their willingness to participate in the study is sought by asking them personally. Only 43 students (74%) were included in the final study. All students are at least on Advanced Diploma level in field of Applied Science specialization (Biology and Chemistry).

All respondents undergo a regular course plan based on the approved delivery plan by the Department. The main difference is their exposure to an open educational resource learning environment. A combination but not limited to a dedicated e-learning course webpage, an adaptive web tutoring system, creative commons videos, transcripts and assessments were used to extend the regular class hours of the respondents. This extension is the exposure open educational resource learning environment.

a. Data Collection

The following variables were considered in the study and were used in mining the student course outcome.

Pre/post Tests Gain: A continuous variable collected from individual student’s gain (difference between post and pre-tests). The content of the two multiple-tests were same and were both deployed using e-learning courseware with a full randomization feature. The pretest was given before the start of the OER exposure and after 4 weeks, the post test was conducted. On this variable, a higher difference indicates improvement in knowledge gain after exposure to OER.

Midterm Exam Result: A continuous variable collected from a graded formal course assessment approved by the Department. This midterm questions undergo rigid scrutiny from course moderator, program coordinator and head of section. This variable has a direct effect on the student course outcome. This assessment is given midway through the delivery and expected to cover half of the course objectives.

Total Time spent in OER: A continuous variable which is the conservative approximation of the time spent by the student in an OER learning environment. This time logs are time consumed beyond official class hours obtained from the adaptive web tutoring system.

Problems Attempted: A discrete variable which is the total number tried by the student to attain certain level of skills mastery in probability.

Mastery Level: A continuous variable which is the overall mastery level of the student obtain from the adaptive web tutoring system.

Attendance: A dichotomous variable that accounts whether the student receive a warning letter or not.

Passing: A dichotomous dependent variable of student outcomes. The first group consist of students who obtain passing mark that ensures them to take the course for the first time (Y=1). The second group consist of students who obtain failing or passing mark that allows them to repeat the course (Y=0).

b. Mining Student’s Outcome using Multiple Logistic Regression

A handful of educational data mining techniques are inevitable in mining student performance in general. The most popular EDM approach in dealing with predicting a dichotomous outcome is based on a logistic regression. Based on literature, about a third of the EDM papers were about predictive mining (Baker, 2009). Among the most mined concept in educational data mining are the research problems that calls for analysis and prediction of a binary outcome – dichotomous. Based on literature, ordinary least squares (OLS) regression is the most widely used technique in predictive mining. On the other hand, this technique is found to be not robust in handling dichotomous outcome mainly because of strict theoretical underpinnings (Peng, 2002). The logistic regression is proposed and is somewhat same with the classical linear regression where the main goal of these techniques is prediction. The main statistical concept that logistic regression is built is the logit – the natural logarithm of an odds ratio. In simplest term, the logistic model predicts the logit of the dichotomous outcome Y (1 = passing the course, 0 = failing the course) from X (a set of predictor variables). In this paper, we employed a multiple logistic regression model given by

\[
\text{logit}(Y) = \ln \left[ \frac{P}{1-P} \right] = b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n
\]

(1)

where \( \text{logit} \) of Y is the natural logarithm of odds - odds are the ratios of probabilities \( P \) of Y occurring to the probabilities of \( Y \) not occurring.

\( b_0 \) represents the intercept, the set of slopes \{b1, b2, ..., bn \} represents the coefficients of regression and the set of \{X1, X2, ...,Xn \} are the distinct predictor variables. Manipulating (1) by applying the laws of logarithms, we can derive the ‘predicted probability for’ given by

\[
P = \frac{\exp(b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n)}{1 + \exp(b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n)}
\]

(2)
It is interesting to note that the parameters of the logistic models are not interpreted the same way as OLS. An intuitive way of interpreting the logistic regression coefficients is by looking at the “odds ratio”

\[
e^b = \frac{P}{1-P}
\]

(3)

The odds ratio for a specific coefficient \( b_i \), \( i = 2, 1, ..., n \) reflects the ratio of the probability that \( Y \) occurs to the probability that \( Y \) did not occur whenever there is a unit change in the predictor variable \( X_i \), \( i = 2, 1, ..., n \) holding other predictors constant.

In this study we formally used a multiple forward logistic model. The calculation was carried out using a statistical package IBM SPSS statistics version 21.

4. RESULTS

The table below shows the mean and its 95% confidence interval of each of the variable. There is a significant mean difference (p=0.000, t=-7.8) in the posttest and pretest results, which suggests that the student gain considerable knowledge on the different skills after their exposure to Open Educational Resource learning environment. The student’s average Midterm score is about 14.5 (72.5%) from a possible full mark of 20.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (n=43)</th>
<th>95CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff (Pre-Post)</td>
<td>2.12*</td>
<td>(1.65, 2.58)</td>
</tr>
<tr>
<td>Midterm Exam Result</td>
<td>14.50</td>
<td>(13.78, 15.21)</td>
</tr>
<tr>
<td>Time spent (minutes)</td>
<td>99.25</td>
<td>(87, 112)</td>
</tr>
<tr>
<td>Problems attempted</td>
<td>119.31</td>
<td>(104, 135)</td>
</tr>
<tr>
<td>Mastery Level</td>
<td>68.18</td>
<td>(64, 73)</td>
</tr>
</tbody>
</table>

*p=0.000, t=-7.8

On the other hand, a total of 4268 minutes or about 99.25 minutes per student was registered log exposure of the students in OER by the adaptive web-based tutoring system. These minutes log by the students were used outside official class hours. This is already a good proof of an extended learning opportunity for the students. The students were subjected to an adaptive tutoring system were they were ask to solve problems randomly regarding the seven skills that was mention in the methodology. The problems attempted by the students’ range from 4472 to 5805 or about 119.31 problems per student for the entire duration of the exposure. This average is more than the actual number of problem that is expected to ask during formal assessment inside the classroom. One more thing is the mastery level of the students, their proficiency in the all the seven skills were captured based on their correct and incorrect responses to the problems they attempted. The mastery level of the students was captured by the adaptive web-based tutoring system. The master level is calculated based on a 60% cut-off percentage on correct over the total number of problems attempted in each of the seven skills in probability. A student within or above this cut-off percentage is considered with "certain" skill mastery level. Based on the data above, on a 95% confidence interval of the mean, the students have at least 64% to a maximum of 74% mastery level.

<table>
<thead>
<tr>
<th>Items and Skills</th>
<th>Mean</th>
<th>VI</th>
<th>95CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you rate your excitement in the idea of integrating</td>
<td>4.27</td>
<td>Very</td>
<td>(4.00, 4.53)</td>
</tr>
<tr>
<td>Please rate the knowledge improvement level in Probability you achieved after the exposure to</td>
<td>4.13</td>
<td>Moderately Improved</td>
<td>(3.88, 4.38)</td>
</tr>
<tr>
<td>I am confident that I have improved my skills and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill1: Understanding basic concept in</td>
<td>4.20</td>
<td>Strongly</td>
<td>(3.96, 4.43)</td>
</tr>
<tr>
<td>Skill2: Calculating Probabilities of Events</td>
<td>4.20</td>
<td>Strongly</td>
<td>(3.89, 4.52)</td>
</tr>
<tr>
<td>Skill3: Combination and Permutation</td>
<td>4.31</td>
<td>Strongly</td>
<td>(4.04, 4.58)</td>
</tr>
<tr>
<td>Skill4: Finding probabilities using two-way table</td>
<td>4.09</td>
<td>Moderately</td>
<td>(3.80, 4.38)</td>
</tr>
<tr>
<td>Skill5: Finding probabilities using addition rule</td>
<td>4.03</td>
<td>Moderately</td>
<td>(3.66, 4.39)</td>
</tr>
<tr>
<td>Skill6: Finding probabilities using binomial distribution</td>
<td>4.22</td>
<td>Strongly</td>
<td>(3.93, 4.51)</td>
</tr>
<tr>
<td>Skill7: Finding probabilities using normal distribution</td>
<td>4.00</td>
<td>Moderately</td>
<td>(3.71, 4.29)</td>
</tr>
<tr>
<td>Average</td>
<td>4.14</td>
<td>Moderately</td>
<td>(3.93, 4.36)</td>
</tr>
</tbody>
</table>
The students were asked to evaluate their experience by looking at their excitement and knowledge improvement level before and after the exposure OER learning environment. In the beginning of the exposure, the students were asked how excited they were in having a different approach to learning. Based on the data, majority of the respondent on the average were very excited to try the Open Educational Resource learning environment. On the average, the respondents categorically say that they moderately improved their knowledge in Probability with a mean of 4.13 (3.88, 4.38). Each skill has been rated by the respondents by at least ‘moderately agree’. This provides proof on a student’s perspective that the exposures help them improved their knowledge and skills in probability.

A forward logistic regression analysis was conducted to predict the student outcome in the course for 43 students using pretest/postest gain, midterm exam result, class attendance, mastery level, total problems attempted, and total time spent in an open educational resource learning environment as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors, as a set, reliably distinguished between passing and failing the course (chi square = 25.542, p=.000, df=6). However, based on Wald criterion, only mastery level (p=.028) after exposure to OER learning environment and Midterm exam result (p=.046) have significant individual contribution to the prediction. On the other hand, Hosmer and Lemeshow Test (4.119, p=.846) suggests that we have a well-fitted model which indicates there is no significant difference between the observed and model-predicted values.

Table 3. Forward Logistic Regression Result

<table>
<thead>
<tr>
<th>Variables</th>
<th>β</th>
<th>Odd Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>DiffPostPre</td>
<td>.620</td>
<td>1.859</td>
</tr>
<tr>
<td>Midterm</td>
<td>.527</td>
<td>1.693</td>
</tr>
<tr>
<td>Timespentminutes</td>
<td>.095</td>
<td>1.100</td>
</tr>
<tr>
<td>MasteryLevel</td>
<td>-.086</td>
<td>.918</td>
</tr>
<tr>
<td>Problemsattempted</td>
<td>-.007</td>
<td>.993</td>
</tr>
<tr>
<td>Attendance</td>
<td>-20.557</td>
<td>.000</td>
</tr>
<tr>
<td>Constant</td>
<td>-8.583</td>
<td>.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Tests</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Omnibus Tests of Model Coefficients</td>
<td>25.542 (p=0.000)</td>
</tr>
<tr>
<td>Nagelkerke R Square</td>
<td>0.677</td>
</tr>
<tr>
<td>Hosmer and Lemeshow Test</td>
<td>4.119 (p=0.846)</td>
</tr>
</tbody>
</table>

A pseudo coefficient of determination Nagelkerke’s $R^2$ of 0.677 indicates a moderately strong relationship between prediction and grouping of the predictor variables. The overall prediction success was 90.7% (70% for those who failed and 97% for those who passed) within a cut-off value of 0.5. The model along with the set of predictors improves the classification accuracy by 14% as compared to a constant model. The model as a whole provides us a good predictive ability better than randomly guessing. These results were all achieved on the first place because of the existence of a new learning environment. The OER learning environment provides a promising, economical and data driven management of education.

5. CONCLUSION AND FURTHER STUDIES

This study mainly focuses on the potentials of EDM and OER learning environment. In this paper, we manage to show how student learning engagement is extended beyond official class hours via exposure to OER learning environment. The viability of this learning environment and its impact to student outcome is also established. The predictive mining also provides us a promising tool in making sense of every student transaction in aid of establishing a proactive student management, course management and curriculum development. It is also interesting to note the study can be further be improved by extending the exposure to a much larger group of students and in a longer period of time (e.g. within an Academic Year). This will enable a parallel result to the current study with a high degree of statistical power.

6. ACKNOWLEDGMENT

We wish to extend our gratitude to the HOD of IT Department for the support and encouragement had extended to the researchers.

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TECHNOLOGY BALANCING IN FLIP LEARNING A RIGOUR AND RELEVANCE TO IMPACT HIGHER EDUCATION

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ABSTRACT
The technology is used exponentially in higher education via distance education, on-line classes and through multimedia simulations. Most of the higher education institute make use of open sources like moodle, blackboard etc. Today, the Flip learning has become an emergent and a dynamic resource where the teachers can upload and author their classes which include lectures, notes, activities and activities. The classrooms are FLIPPED where students learn prior to the class and teachers are the facilitators rather than giving lectures. Due to the technology usage growth most of the students access education via applications of distance education, Internet access, simulations, and educational games. This has raised substantially the focus and importance of educational technology balancing in higher education. In this paper, we examine the past and present research trends, with emphasis on the role and contribution of research evidence for informing instructional practices and policies to improve learning in higher education. Important concepts discussed include varied conceptions of “effective” technology uses in classroom instruction as topics for research, historical trends in research approaches and topics of inquiry, alternative research designs (McCulley, Y. K., 2012) for balancing technology use and classroom teaching and suggested directions for future research. Attention is devoted to describing varied experimental designs as options for achieving appropriate rigour and relevance of research evidence, and using mixed-methods research for investigating and understanding technology applications in complex real-life settings.

Keywords: FLIP Learning, Higher Education, Technology, Learning Management, Classroom leverage.

1. INTRODUCTION
Innovations in technology driven teaching and learning process towards new dimensions. E learning made the easy flow of information and availability of this information for large number of participants. Further influence of devices, programming concepts helped to create better user interfaces, which played a major role in establishing interaction between users. Education technology further helped utilization of learning resources across various platforms irrespective of technology constraints. Evolution of new concepts like blended learning, collaborative learning, activity based learning and Flipped learning further accelerated and expanded the horizon of teaching and learning to greater extent. Among these new approaches of learning process, Flipped learning contributes major advantage of active participations, continuous engagement and self-learning environment for the participants.

2. EVALUATION OF E-LEARNING PARADIGM
The process of E-Learning begins with E-content development and extending towards creation of digital libraries. Integration of various learning resources in the form of learning material needs intense usage of ICT framework. Further embedding interactive interfaces over the E-contents helps multiple dimensions of user participation because interactive learning is the essential basic requirement for any teaching and learning process. Incorporating performance evaluation criteria for the E-learning platform is a challenging task. Further identification of right E-activities for active student engagement needs holistic approach towards teaching and learning process.

Education technology utilization for spearheading teaching and learning process begins with embedding of various technologies over the top of these teaching and learning resources. Learning management system (Petherbridge, D., & Chapman, D., 2007) helps to integrate learning resources, evaluation criteria, establishment of user interactions through discussion forums and student participation to a greater extent.

Content management system works as digital repository for knowledge process. Usage of CMS in E-learning platform crosses the barriers of restricted usage of information. Further CMS helps to create the work processes by linking all the levels of users and teachers. CMS also extends utilization of hybrid contents, multimedia components and authoring framework. Online applications accelerate the connectivity between the users and the contents without any geographical barriers. Whereas standalone applications harnesses the usage of E-contents independent of technologies and platforms. ICT framework helps to connect the user with the teaching learning process using internet, intranet, and cloud technologies. Further smart devices and pervasive systems helps to establish connection between dynamic users irrespective of mobility.
3. PROPOSED FLIPPED LEARNING FRAMEWORK

Flipped learning drives the participants from passive listening towards active learning. Flipped experience promotes student learning needs by active student involvements, for which student himself or herself becomes the driver thereby attains greater control over their learning. Very first, flipped learning transforms the flow of knowledge to be flipped because of active student engagement for learning.

Due to the flip process, student experiences the active learning and this will lead to develop knowledge for them. Rapid innovations in digital technology, narrow down gap between online learning and in-class learning creates a positive thrust for blended learning, which is the fundamental influencing factor for flipped learning. Further flexible time factor enhances student interest for participations there by accelerates the learning process. During flipping, along with flexible time (Lonn, S., & Teasle, S., 2009) factor, technology also influences collaborative environment creations among the participants. These factors are described in the outer circles as shown in Fig 2.

Contents are the internal factors, which plays a major role in flipped learning. Students or the participants develop their basic understandings using these contents. Student active engagements during flipped sessions refine these understandings into a self-developed learning. Active participation in flipped environment (Pleasance, S., 2010) transform these learning into an flipped experience. At the end student discussion leads towards refining of flipped experience into self-developed knowledge.
4. **FUTURE WORK**
Flipped learning is a model driven approach. Flipped classes are in the beginning stages of transformation and acceptability with the large number of higher education aspirants needs active participation. Hence, the gap between traditional (Little-Wiles, J., & Naimi, L., 2011) class approach and flipped approach needs to be narrowed down. Research also needs to be done on various concurrent sub-models, which can be additive influencing factors for flipped learning. Further exploration also needs to be done on performance measurements of the flipped learning outcomes, that can help to understand the benefits of the flipped class approaches. Key research areas also needs to be identified in learning methodologies, ICT frame works and associated driving factors for flipped approaches.

5. **CONCLUSION**
Transformation in education triggered changes in teaching and learning process. Technology innovation created new way of possibilities for teaching and learning in higher education. (Watson, W.R., & Watson, S.L., 2007) Education technology integration for teaching and learning using learning management system, content management system established better interaction between teachers and the learners. These technologies, further provided vide varieties of data and information transformation. Collaborative learning gave focuses towards learning across platforms and reduced the geographical barriers between the participants. Flipped class models changed the process of learning from passive to active mode. Integrating ICT within the flipped class model further enhances the learning process into self-developed knowledge.

REFERENCES
ASSESSMENT ON THE MOTIVATION OF INTERNET USAGE OF 
GULF COLLEGE EMPLOYEES

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ABSTRACT
This study evaluated the Internet usage motivation of Gulf College employees. The variables used in assessing the Internet usage motivation based on the Uses and Gratification theory (U&G) Theory by McQuail(1994) using the four variables: Information, Entertainment, Social Interaction and Personal identity. In this paper, the researcher presented and discussed the employees’ motivations why they are using Internet in their daily lives and the different purposes why they are using it. The objective of this study is to have a deeper understanding on what are the employees’ motivations why they use Internet. The study used descriptive research design by floating a structured questionnaire to the respondents. Total population was used for data gathering.

It was found out that the respondents motivations based on UG theory were information and social interaction. The output of this study will help the management on how to improve the Internet experiences of the employees and to propose more programs for the benefits of the college in using the Internet.

Keywords: Internet, Social Networking, Motivation, Surfing, Internet Usage

1. INTRODUCTION

Internet is important for everybody and it makes changes in our life. Besides, it motivates us to know more about so many things in our life, such as people, business and technology. According to Comer (2009), the growth and the uses of the global Internet are among the most interesting and exciting phenomena in networking. In 1980, the Internet was a research project that involved a few dozen sites. Today, the Internet has grown into a production of communication system that reaches all the populated countries of the world. On the website intenetworldstats.com it was stated that 3,035 million or 42.3% of the world population using the Internet based on the survey last June 2014. Internet has created dramatic economic shifts. Internet has made communication available to individuals and has changed how people in the business world communicate. In addition, an entire industry engaged that develops networking technologies, products and services.

The use of the Internet is obviously increasing and many new ways of using it are constantly appearing to the world. Therefore, a lot of social network programs and applications are provided by different companies to help people to stay updated and informed of everything new and unique around the world. Many social network applications are being used around the world by different users like teenagers, young people, workers, students and etc. Internet is the nowadays communication way preferred by adults and young people who can easily connect and enjoy their free time due to its easy usage and constant availability.

Most people use Internet for different purposes including entertainment, education, services and working. As a result, many new applications and websites are being created to meet the users’ needs all over the world like Instagram, WhatsApp, Twitter, Snapchat and etc. These social networking applications have a direct impact on students' academic achievement since most of their users are basically students at schools and universities. In this paper, the researcher would be presenting and discussing how the employees of Gulf College are using Internet in their daily life and the different purpose why they are using it.

The purpose of this study is to have a deeper understanding on what are the employees’ motivations and why they use the Internet. The output of this study will help the management on how to improve the Internet experience of the employees and to proposed more programs for the benefits of the college in using the Internet.

2. STATEMENT OF THE PROBLEM

This study aimed to evaluate the Internet Usage of Gulf College Employees. Specifically it seeks to answer the following questions:

1. What are the major Internet activities the respondents usually engage?
2. What major purpose(s) of the respondents in using the Internet in terms of the U&G Theory variables?

3. METHODOLOGY

The researcher use Descriptive Research which includes surveys and fact-finding inquiries of different kinds. The major purpose of descriptive research is description of the state of affairs as it exists at present. The main
characteristic of this method is that the researcher has no control over the variables; the researcher can only report what has happened or what is happening (Kothari, 2004).

The researcher also utilized Internet websites to get information on the different usage of Internet by employees and educational websites so the researcher would come up with an effective and informative report. A survey containing a checklist would help also in gathering specific information about employees' different usage of Internet. A total of 62 employees responded to the questionnaire from the three academic departments: Faculty of Foundation Studies, Faculty of Business and Faculty of Computing.

4. THEORETICAL FRAMEWORK

The researcher anchored the sub-variables used on this study based on the output of the research by Peter Bae Brandtzæg and Jan Heim entitled WHY PEOPLE USE SOCIAL NETWORKING SITES. On their study they use the U&G Theory of McQuail.

Uses and Gratification (U&G) Theory according to McQuail(1994) there are four main motivational needs: 1.) information, 2.) entertainment, 3.) social interaction, and 4.) personal identity.

<table>
<thead>
<tr>
<th>U&amp;G THEORY</th>
<th>FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Information, sharing and consuming content, debating</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Unspecified – fun, time-killing</td>
</tr>
<tr>
<td>Social Interaction</td>
<td>Socializing, friends, family, new relations, free SMS</td>
</tr>
<tr>
<td>Personal Identity</td>
<td>Profile surfing</td>
</tr>
</tbody>
</table>

Uses and gratification is a true communication theory with social psychological roots. The strength of this theory is to allow researchers to study communication psychological roots. The strength of this theory is to allow researchers to study communication from several sets of psychological needs, psychological motives, communication channels, communication content, and psychological gratifications within a particular context. Lin(1996:574)

Using the gratification theory we will have a deeper understanding on what the respondents use the Internet for. This theory looks at what the respondents do with the Internet and why.

5. DATA ANALYSIS

<table>
<thead>
<tr>
<th>INTERNET ACTIVITIES</th>
<th>BUSINESS (%)</th>
<th>COMPUTING (%)</th>
<th>FOUNDATION (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-mail</td>
<td>100</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>Downloading files</td>
<td>96</td>
<td>88</td>
<td>78</td>
</tr>
<tr>
<td>Playing Games</td>
<td>17</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Social Networking Sites</td>
<td>91</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>On-line shopping</td>
<td>4</td>
<td>31</td>
<td>26</td>
</tr>
<tr>
<td>E-learning</td>
<td>78</td>
<td>75</td>
<td>61</td>
</tr>
<tr>
<td>Entertainment</td>
<td>43</td>
<td>69</td>
<td>74</td>
</tr>
<tr>
<td>Research</td>
<td>87</td>
<td>94</td>
<td>87</td>
</tr>
</tbody>
</table>

Note: Multiple Responses

Others:

**Business**: Reading, Read Newspaper, Studies, Communicating

**Computing**: Getting in touch with family chat as in, watch U tube related study material, Blog

**Foundation**: E-Banking

As showed on Table 2 and Chart 1 all the respondents from business and foundation use e-mail and 94% of the respondents from computing use it. Since all the respondents were lecturers it is also evident that they utilized Internet for research activities and downloading files. The respondents were less interested in playing games and on-line shopping.

The employees of Gulf College use Internet as a part of their daily life. The major activities that they do on the Internet are using E-mail, Downloading files, Researching and Social Networking Sites. It is evident that Gulf
College supports Green Computing because they use e-mail to communicate. Emails do not use paper and environment friendly and save a lot of trees from being cut down.

**Chart 1. Assessment on the Internet Activities of the Respondents**

<table>
<thead>
<tr>
<th>RANK</th>
<th>BUSINESS</th>
<th>COMPUTING</th>
<th>FOUNDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>E-mail</td>
<td>E-mail, Research</td>
<td>E-mail</td>
</tr>
<tr>
<td>2nd</td>
<td>Downloading of files</td>
<td>Downloading of files</td>
<td>Research</td>
</tr>
<tr>
<td>3rd</td>
<td>Social Networking</td>
<td>Social Networking, E-Learning</td>
<td>Downloading files</td>
</tr>
<tr>
<td>4th</td>
<td>Research</td>
<td>Entertainment</td>
<td>Entertainment</td>
</tr>
<tr>
<td>5th</td>
<td>E-Learning</td>
<td>On-line Shopping</td>
<td>Social Networking Sites</td>
</tr>
</tbody>
</table>

**Table 3. Ranking of the Internet Activities of the Respondents**

**Chart 2. Assessment of the Purpose of Using the Internet by Three Departments**

**Table 4: Assessment on the Purpose of Using the Internet by the Respondents**

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>BUSINESS (%)</th>
<th>COMPUTING (%)</th>
<th>FOUNDATION (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Relations</td>
<td>26</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Friends</td>
<td>57</td>
<td>63</td>
<td>57</td>
</tr>
<tr>
<td>Socializing</td>
<td>57</td>
<td>69</td>
<td>61</td>
</tr>
<tr>
<td>Information</td>
<td>87</td>
<td>88</td>
<td>96</td>
</tr>
<tr>
<td>Debating</td>
<td>13</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Free SMS</td>
<td>30</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>Time-killing</td>
<td>13</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Unspecified fun</td>
<td>17</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Family</td>
<td>61</td>
<td>44</td>
<td>57</td>
</tr>
<tr>
<td>Profile Surfing</td>
<td>22</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Sharing/Consuming</td>
<td>52</td>
<td>75</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: Multiple Responses
Unlike on the study entitled “Why People Use Social Networking Sites”, first rank on their motivational factor based on UG theory is “new relations”. Although they fall on Social Interaction but socializing with family and friends are the motivations of the respondents. Very few respondents use the Internet to get new relations.

Table 5 Ranking on the Motivation of the Respondents when Using the Internet

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Business</th>
<th>Motivational Needs</th>
<th>Computing</th>
<th>Motivational Needs</th>
<th>Foundation</th>
<th>Motivational Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Information</td>
<td>Information</td>
<td>Information</td>
<td>Information</td>
<td>Information</td>
<td>Information</td>
</tr>
<tr>
<td>2nd</td>
<td>Socializing, Information</td>
<td>Social Interaction</td>
<td>Socializing</td>
<td>Social Interaction</td>
<td>Socializing</td>
<td>Social Interaction</td>
</tr>
</tbody>
</table>

As gleaned on Chart 2, table 4 and 5, the major purposes of the respondents in using the Internet based on UG Theory variables are Information and Social Interaction. According to Nadkarni et.al (2011) on the study entitled Why do People use Facebook? revealed that the respondents use Facebook by two primary needs: 1.) the need to belong and 2.) the need for self-presentation.

The output of this study was the same on the output of the study of Richardson(2003) entitled Uses and Gratifications of Agnostic refuse: Case Study of a skeptical On-Line Congregation, stated that information seeking or retrieval of information appears repeatedly as a primary gratification for Internet use.

On the study of Weiser(2000: 723-743) entitled The functions of Internet Use and Their Social and Psychological Consequences states that “the Internet’s social and psychological effects were dependent on the user’s reasons for using it. In other words, the Internet’s social and psychological effect depends on the function it serves for the user.”

Since all the respondents are lecturers their first motivation to use the Internet is to get information from it because they need that information on their job especially in teaching.

It is also evident in this study that their second motivation is social interaction with family and friends because many of the respondents were ex patriate they use the Internet to communicate with their friends and families living on other countries like India, Philippines, Pakistan, etc.

6. CONCLUSIONS

The major activities that they do on the Internet are using E-mail, Downloading files, Researching and Social Networking Sites. It is evident that the respondents motivations is using the Internet is for academic purposes. According to (Meyen, Michael, et.al) on their study entitled Internet Usage By Different Users Sociology Essay states that the “result of the study shows the relationship between different level of internet usage and capital of seven types of Internet users. The professionals use Internet because of work or business. Professionals are well educated and used Internet to increase social identity. The study result plainly shows that the usage of Internet is influenced by their habitus, life experiences, age, education level and social position, etc.

- The purposes of the respondents in using the Internet based on UG Theory variables are Information and Social Interaction.

7. RECOMMENDATIONS

The respondents need to improve the usage of E-learning sites because as an educator E-learning sites are useful to support their lessons and a big help for lecturers as an additional references.

The college can offer distance learning or Open University because all lecturers are knowledgeable on how to use the Internet.

REFERENCES

IMPACT OF COLOR COMBINATIONS IN WEBSITE ACCESSIBILITY

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ABSTRACT
Websites these days have become an interface for communication between different organization and their users in this present era of information and communication technology. Designers/Webmasters are putting lots of effort in providing users with complete facilities of the concerned institutions / organizations online through beautifully designed websites. The websites these days acting as an online agent via which different categories of the users can get their work done without paying physical visit to that organization. In this wide role of websites in humans for seeking multiple type of information the responsibility of the developers / designer and the concerned institutions / organizations increases manifold. It forces the web designers to design websites in such a fashion so that their behavior remains similar when accessed by different categories of the users. The institutional websites must be designed in such a way that they are also accessible to the dynamic categories of the users available worldwide including those suffering from different types of visual impairments like Colour Blindness etc. Use of Colours in Website Design is a very important issue which needs to be addressed in order to improve the aesthetic sense of a Website. It is the first and most important characteristic / design parameter which force the user to make first hand opinion about the quality of a Website. Authors in this paper have developed an online Automated Tool using .NET Framework (C#) to study different types of Color Combinations recommended and applied during website design. Five different categories of the websites (Government, Commercial, Educational, Social Networking and Job Portals) were evaluated to test their adherence to standard guidelines / recommendations. The online Automated Tool developed by authors test the website Colour Combinations on the basis of different standards prescribed in W3C guidelines document WCAG 2.0 in guideline 1.4(Distinguishable) [4]. The Automated Tool act like a parser (HTML and CSS) which renders the complete code of a website and produces result on the basis of the various types of color combinations used to develop websites. Various groups of user are sensitive to different combinations of colors. The Automated Tool developed by the authors evaluates websites on the basis of three different colour blindness such as Protanopia, Deuteranopia and Tritanopia and reports the visibility of different tags by the persons suffering from the above given three types of visual impairments. The results produced shows that out of the five different categories of websites employed for analysis the Job Portal websites follows the minimum of standards as far as color combination parameter is concerned and hence least visible to the visually impaired people i.e. colour blind. Whereas Government websites show least divergence from the standards and hence are designed by strictly adhering to the standards design guidelines recommended by W3C for designing websites.

Keywords: Website Design, Color Combination, Protanopia, Deuteranopia, and Tritanopia.

1. INTRODUCTION
Website is combinations of related web pages served through single domain. Numbers of different kinds of websites are there but the most widely used categories of the websites are Educational, Commercial, Government, social networking and job portals. These days it has become mandatory for an organization big or small to develop a website to render its services online through different networks. With increase in the number of websites and its popularity it becomes necessary for an organization to put lot of efforts to design websites carefully so that it can easily cater to the need of all the different categories of the users. Numbers of websites design issues are there which needs to be kept into consideration while designing websites. One of the most important issues among all is the color combinations employed. The availability of a large number of colors now a day for webpage designing has led to color combination issues as different sections of users suffering from various color blindness problems are affected to different levels by the colors employed for designing purposes. With the advent of availability of large number of color combinations it becomes mandatory for a website to have colors that are visible to almost every section of the users. Different organizations are working in the field of website design which is responsible for design, development and implementation of different types of website development standards. For evaluating website design according to the recommended standards, a wide variety of online tools are available based on certain properties? These online tools test the website visibility to each and every group of users including those suffering from different types of visual impairments. On the basis of study carried out the authors in this research paper have developed its own online Automated Tool for testing website Colour Combinations recommended by W3C for designing websites. The Automated Tool reports those colour combinations from website design which are not recommended in design guidelines and hence not visible to the users suffering from different visual impairments. The tool basically focuses
on the Color Combinations which are not visible to the people suffering from different types of Colour Blindness which includes Protanopia, Deuteranopia, and Tritanopia. The working of the entire tool is based on the standards recommended by W3C for web design. The working of the Automated Tool developed is explained in below given “Fig. 1”.

The Automated Tool developed by the authors will take URL of the website as input and then send it to the server for generating different types of colour combinations used in websites. From server the HTML code of the website is supplied to the interface for making comparison with the existing standards. The tool contains two different types of parsers called as CSS and HTML parser for evaluating HTML code of the websites and types of CSS used in website design.

The algorithm used by the Automated Tool for fetching and making comparisons of the different colour combinations used in website design is given below:

**Algorithm 7**: Algorithm to determine Color Combination in website design.

**Input**: Website URL

**Output**: list of color combinations employed for each tag and effect on user groups.

**Method**: (Numbering of the steps is done for better understanding)

**Begin**

**Step I**: Request generation for obtaining HTML file of the website by passing URL to the server.

**Step II**: Parse the HTML file and store all tags with their attributes in the database.

**Step III**: For Each tag in database

i) Determine its foreground and background color

ii) If (background-color=="red" and foreground-color=="blackish" or background-color=="purple" and foreground-color=="yellow" or background-color=="orange-tinted-red" and foreground-color=="yellow-hue")
Tag will not be visible to portanopia defected user group.

iii) Else If (background-color=="red" and foreground-color=="dark green" or background-color=="green" and foreground-color=="dim gray")
Tag will not be visible to deuteranopia defected user group.

iv) Else If (background-color=="yellow" and foreground-color=="violet" or background-color=="green" and foreground-color=="cadet blue")
Tag will not be visible to tritanopia defected user group.

v) Else
Tag will be visible to every user.
End

2. METHODOLOGY

A. Problem Identification

Web pages are basically the platform for communication between an organization and users of wide variety scattered all over the world. The strangers on websites for the first time share their maiden impressions with web producer and even a reader also shares their impressions and communicates through a web. It becomes very difficult as well as crucial for the designers to satisfy all the dynamic categories of the users with their multiple choices in colour preferences for categories. Colors are basically the medium through which we can convey wide variety of information to the users in the form of images and messages on our web page [1].

Researchers and scientists believe that colors greatly influence the human psychology. Consequently, the color patterns that we choose in our website are very important in nature. Coloring patterns vary in several different ways and it also depends on its properties like saturation and brightness. When a user visits a web page, he will get excited, happy or bored. All this determined by the color selection [2].

Color is an equally important factor in Webpage design considerations. The use of color combination is very crucial while selecting backgrounds and foregrounds of a web page. An important design issue is to select the background and foreground colors with enough contrast to make the content visible. Using enough contrast, such as analogous and monochromatic colors, makes it hard for the readers to read the text. Whereas, too severe contrast can also cause physiological headache. These days people are working a lot on website accessibility. So in order to cater to the need of the user of each category it is highly required that we must make web sites which will be accessible to the peoples with different type of disabilities. Many people today have color blindness problem. In such case while making website we should consider such issues. If a person is not able to differentiate between two colors and these colors are used in site, than the person is not able to get the info from site. Another important aspect of color combination is its impact on online industry, as it controls the decision making power of a consumer. According to a survey conducted by Institute of Color Research, a large section of product consumers makes a quick assessment of the product within one and a half minute and this quick assessment depends totally on color combination used. Therefore, using right color combination in a website can do or undo the chance of getting success in the virtual world.

Similarly, there are other factors on which there is a direct compact of the color combination used by the website. So, the choice of appropriate color selection during the design process is of great importance for the accessibility purposes. A web design guideline often includes recommendation for using appropriate color combinations in websites. Many of which recommends high contrast between text and background with particular emphasis on the traditional black on white [3].

B. Online Tool for Testing Websites

Based on the literature survey the authors have devolved their own Automated Tool for testing different categories of the websites. The Automated Tool developed will test the website on their adherence to the standards guidelines recommended by W3C regarding selection of different colour combinations in website design. It reports the users/developers about those colour combinations which are not recommended in website design and subsequently they will not be visible to the users suffering from different types of visual impairments (i.e. Colour Blind). Basically the Tool is developed to check the deviations in website from recommended standards / guidelines for website design. The color related problems in the designs of websites are evaluated on the basis of the various types of color combinations used by the web designers in developing various parts of the website and their effects on the section of the users that suffer from color blindness problems. Various groups of user are sensitive to different combinations of colors. While certain users are able to recognize any combination of colors that may cause hindrances to other group of users. Based on the color recognition capabilities various categories of users have been devised. The three common types of color blindness user categories are Protanopia, Deuteranopia, and Tritanopia. The website Design Evaluator provides statistics for this parameter by taking into consideration various categories of color blind users and parse all the elements of web pages, evaluate their background and foreground color and then test their visibility against Protanopia, Deuteranopia, and Tritanopia persons.
C. Sample Data

The Sample data undertaken for the study for gathering statistics related to the selection Color Combinations in website design is given below in Table 1. A total of 100 websites belonging to five different categories were selected for analysis. Since different categories of websites are designed keeping in view the different types of constraints associated with them. Therefore the diversity among different categories of websites is considered to have better understanding of the variations in the features undertaken for the parameter with the help of Automated Tool developed by the authors.

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Govt. Websites</th>
<th>Educational Websites</th>
<th>Commercial Websites</th>
<th>Social Networking</th>
<th>Job Portal Websites</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td><a href="http://www.nagaland.ni">www.nagaland.ni</a></td>
<td><a href="http://www.jmi.ac.in">www.jmi.ac.in</a></td>
<td><a href="http://www.hul.co.in">www.hul.co.in</a></td>
<td><a href="http://www.myspace.co">www.myspace.co</a></td>
<td><a href="http://www.placementin">www.placementin</a></td>
</tr>
</tbody>
</table>

D. Results and Discussions

The statistics obtained after testing the websites given in above Table 1 taken as Sample data using Automated Tool is recorded in Table 2 and Table 3. The obtained data is then analyzed by framing it into a pie chart and graph as shown below in “Fig. 2” and “Fig.3”.

<table>
<thead>
<tr>
<th>Colour Combination standards</th>
<th>Websites without colour combination problems (in %)</th>
<th>Websites with colour combination problems (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Websites Categories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Websites</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>Job Portal Websites</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Social Networking Websites</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Commercial Websites</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Government Websites</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>
Hence they are visible to all the users available worldwide including those suffering from different types of visual impairments i.e. Colour Blindness (Protanopia, Deuteranopia, and Tritanopia).

**Analysis based on different categories of websites separately for Color Check parameter:** Statistics taken from Automated Tool in testing Color Combination for different categories of the websites taken as Sample Data shown in Table: 1. The testing of Government category of websites is done by using the Automated Tool developed by the authors for testing colour combinations in website design. The Automated Tool determined the different color combinations in government websites which are not visible to any user suffering from any type of visual impairments i.e. Colour Blindness (Protanopia, Deuteranopia, and Tritanopia). It has been observed from “Fig. 4”, that about 30 percent of government websites are having color combinations as per recommended standards provided by W3C and all other government sites are not completely visible to the users with any type visual impairments because of non adherence to the standards guidelines recommended by W3C for designing websites.

The testing of all the Educational Websites taken as sample data was done by using the Automated Tool developed to determine the selection of color combination in websites design for various types of commonly found color visibility problems among the users. It has been observed from “Fig. 5”, that on average only 15 percent of educational sites are having color combinations as per recommended standards provided by W3C and visible to each and every type of users available worldwide including those suffering from different types of visual impairments. All others websites are not designed as per the recommended web design standards hence they will not be visible to users suffering from any type of visual impairments.

The commercial category of websites was tested by using Automated Tool developed by the authors for testing website strictly as per the standards recommended by W3C for website design. The Automated Tool developed determined the different color combination in website design for various types of commonly found color visibility problems among the users.
It has been observed from “Fig. 6”, that on average 05 percent of commercial sites are having color combinations as recommended in the standards provided by W3C. All other websites taken as sample data are not completely visible to users with any type of visibility disorder. The testing of Social Networking websites was done by using the Automated Tool developed to determine the selection of different color combination in given websites for various types of commonly found Visual impairment among users i.e. Colour Blindness. It has been observed from “Fig. 7”, that about Twenty Five percent (25%) of Social Networking Websites are having color combinations according to the recommendations in the given standards provided by W3C. 75% of the Social Networking Websites are not completely visible to different users with some sort of wrong selection of Colour Combinations that are not visible to people suffering from different types of visual Disability.

Again the testing of all the Job Portal websites was done by using the same Automated Tool developed to determine the color combination error of websites for various types of commonly found color visibility problems among the users. It has been observed from “Fig. 8”, that on average 05 % of Job Portal websites are having color combinations as per recommended standards and guidelines provided by W3C while rest of all job portal sites are not completely feasible to users with some sort of feasibility disorder.

The above given analysis carried out on different color combination issue in website design using our own Automated Tool clearly indicates that websites are neglecting recommended guidelines and necessary criteria for color selection in websites that otherwise must be considered for providing uniform accessibility to each and every type of dynamic categories of the users worldwide.

During evaluation of websites with the help of Automated Tool which is designed according to the W3C Guidelines / Recommendations it is been found that the websites are not designed as per recommended Standards / Guidelines and Webmasters / Designers responsible for designing different types of websites are also not adhering to standard Guidelines / Recommendations. Failing which they are not visible to the people suffering from different types of visual impairments i.e Colour Blindness like Protonopia, Deutrnopia and Tritinopia.
As a consequence the websites are not able to provide the services to the section of society which is suffering from above given disabilities. The results obtained confirmed that the webmasters responsible for website design are not following the complete set of recommended standards / guidelines concerning website design. It has been observed that rigorous and sincere efforts are required to meet with these recommended standards and criteria w.r.t color combination parameter in order to make website accessibility universal for all the dynamic categories of the users including those suffering from different types of visual impairments.

3. LIMITATIONS

The main limitation associated with the Website Design Evaluator tool is that it is not able to evaluate the effect of the color on each other in the nested tags. It has already been discussed that this tool determines the compatibility of the color combination used within a website to the user by considering the background and foreground colors.
used for the tags. In case of nested tags the tool is unable to consider the mutual effects of the tags. It considers each
tag in the nested tags as distinct tag and doesn’t considers the effect of foreground and background colors of outer
tags on the inner tags that participate in the nesting while in reality they have a considerable effect on one another.
The combinations of colors used in outer tags have a one to one effect on the colors used in inner tags and vice versa.

4. FUTURE SCOPE

In future all the problems that have been observed in the tool in view of the color combination issue will be
considered for evaluation. The area that plays a leading role in determining the compatibility issues with the color
combinations on various user categories can also be considered to design WebPages that are more effective and
efficient, having better user satisfaction capabilities and adhere to the standards recommended by concerned
organizations in a more appropriate and efficient way. The problems that have been observed in case of nested tags
will be evaluated to understand their mutual effect on one another. All the features under consideration will be added
to the parameter to enhance the accuracy of the results provided by the tool so that designers/developers will be able
to solve maximum of the issues related to color combinations used and thus enabling them to build websites that are
accessible to any category of the users.

5. CONCLUSION

Color Combination in website design controls and affect the look and feel of the web site. Colors also add into the
aesthetic sense of a website. Addition of a few colors can make a boring site attractive, a good site unattractive, or
can evoke emotional responses. During website design phase the Designers/Webmasters should select colors which
enhance their website’s good visual and emotional effects. Selection of recommended colors helps the dynamic
categories of the users to enjoy the web-experience in right perspective.

Increasing accessibility for people suffering from different types of visual impairment (i.e. colorblind users) is an
important step to develop professional designed websites. There are some considerations that we need to adopt in
order to increase accessibility for different types of colorblind readers.

It is strongly recommended that designers must use strong and bright contrast between foreground and background
colors for your page text and different images on websites. Even totally colorblind readers can also differentiate
between such type of colour selection scheme of bright with dark colors [1, 5].

The website designer has a responsibility to choose the appropriate colors during the design phase recommended by
the standards organizations so that the user does not get lost or confused. Designers/developers cannot assume that
the websites which they have developed will run fine and behaves similar when open in multiple platforms until a
proper colour selection has been made during its design phase.

6. ACKNOWLEDGMENT

The authors wish to give sincere thanks to all those working in the field of Website design specially pertaining to
colour Combinations for providing relevant information. We are also thankful for sharing the valuable thoughts and
information by different Academicians and Designers/Webmasters working in different educational institutions and
websites development houses respectively related to website design. A special thanks to W3C (World Wide Web
Consortium) for recommending different website design standards / guidelines. These standards help the website
designers and webmasters to improve upon website design to a greater extent. The standards recommended by W3C
regarding different design parameters make website behaviors uniform for all the categories of users including those
suffering from different types of visual impairments.

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TO ASSESS THE ROLE OF CD4 CELL COUNTS AND OTHER OPPORTUNISTIC INFECTIONS TO ESTIMATE THE MORTALITY OF HIV/AIDS PATIENTS ON ART IN THE PRESENCE OF COMPETING RISKS

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ABSTRACT
The aim of this paper is to assess the effect of CD4 cell counts on survival of AIDS patients and to identify the various independent life threatening risks that AIDS patients are exposed to day to day life. These risks have been categorized as Tuberculosis (TB), Diarrhea (DR), Oral Disease(OR), Bacterial Meningitis (BM), Herpes(HR), Hepatitis(HP) and other disease(OD) for the data collected between 2004-2014 of AIDS patients in an ART center of Delhi, India. The Crude, Net (type-I & type-II) and Partially Crude Probabilities of death for these risks have been computed with respect to CD4 cell counts which have been categorized as \(\leq 350\) and \(>350\) cells/mm\(^2\) according WHO guidelines. The analysis of this data reveals that AIDS patients with CD4 count < 350 cells/mm\(^2\) and suffering from TB and Diarrhea are exposed to the higher risk of death than other prevalent opportunistic infections. Further, Net probability (Type-I & II) of death of AIDS patients with lower CD4 shows the higher mortality of AIDS patients in almost all the opportunistic infections. Partially Crude Probabilities of death for TB and Diarrhea with respect to other opportunistic infections are highly variable and Partially Crude Probabilities of death for other opportunistic infections in the absence of TB are very much alike. Results also highlight the substantially higher risks of mortality in individuals with CD4 \(\leq 350\) and confected by various coinfections.

Keywords: AIDS; CD4; T.B.-Tuberculosis; B- Hepatitis-B&C ; DR- Diarrhea; BM- Bacterial Meningitis; HP- Herpes; O.D.-Other Diseases; O.I.-Opportunistic Infection; Net; Crude; Partially Crude probability of death.

1. INTRODUCTION
Currently, Human Imuno deficiency virus (HIV) infection has assumed a magnitude of an international pandemic [Quinn, T.C. (1996), Mann, J.M. and Tarantola, D.J.M. (1998)] and it’s mostly striking in Asia [Islam, A., et.al.(2002)]. Approximately 36 Million HIV infected person have been estimated worldwide and 1.2 million people have died from HIV related causes globally (WHO report 2015). It is believed that nearly 90% of all HIV infected people are living in developing countries [Quinn, T.C. (1996)]. India has third largest HIV epidemic in the world. It has recently estimated the 2.5 million individual are living HIV infection till 2014 in India. (UNAIDS GAP report 2014). All these above figures indicate the gigantic magnitude of this infection and hence warrant an urgent need to do an in-depth study of the fatality of various diseases to which the HIV patients are exposed to Anti-retroviral therapy (ART) has been playing very important role in treatment of HIV/AIDS patients. ART has the potential both to reduce mortality and morbidity rates among HIV-infected people, and to improve their quality of life. Free antiretroviral treatment (ART) has been available in India since 2004 for HIV infected patients. At ART clinics, people living with HIV can access testing and counselling (HTC), nutritional advice and treatment for HIV and opportunistic infections. HIV patients are required to take a CD4 count test every six months [NACO (2013) 'India: Annual Report 2012-13]. Moreover, the country is now rolling out reminders to people about their testing appointments with the aim of increasing overall attendance [WHO (2013) 'Global update on HIV treatment 2013]. After using ART and with the improvement in medical facilities, India’s HIV epidemic is slowing down, with a 19% decline in new HIV infections (130,000 in 2013), and a 38% decline in AIDS-related deaths between 2005 and 2013 [ UNAIDS GAP report 2014]. At the end of 2013, more than 700,000 people were on antiretroviral therapy, the second largest number of people on treatment in any single country.

CD4 cell counts are considered one of the most important predictors to check the intensity of HIV virus in the AIDS patients. A healthy person contains approximately 1200 CD4 cells per mm\(^2\) in blood. HIV virus attacks on immune system and CD4 cells are deteriorated accordingly. Initially, it was recommended by Center for Disease Control
(CDC) to initiate ART if CD4 cells goes below 200 cells per mm\(^3\). WHO suggested the benefits of initiating ART bit earlier to get better results of ART [WHO report 2013: Consolidated ARV guidelines 2013]. Moderate-quality evidence from two randomized controlled trials and several observational studies shows that initiating ART at CD4 < 350 cells/mm\(^3\) significantly reduces mortality, disease progression and the incidence of opportunistic diseases, especially TB and non-AIDS-defining conditions. [WHO report 2013: Consolidated ARV guidelines 2013].

In this paper, we estimate the mortality of HIV patients with respect to various risks while taking into account their CD4 cells component. This paper is an extension of the work by Grover, et.al. (2012), wherein CD4 cells and few other opportunistic infections were not considered in estimating the survivability of AIDS patients. The data comprises of AIDS patients in Delhi and NCT region who are exposed to various life threatening risks. We have collected live data of AIDS patients in the Anti-Retroviral Therapy (ART) center located at Ram Manohar Lohia (RML) hospital at Delhi. RML is one of the largest centers in northern India, where patients come for their treatment from not only Delhi but also from various regions located nearby this city. We considered Competing Risk Theory [Biswas, S. (1993), Chiang, C.L. (1968), David, H. and Moeschberger, M. (1978)] for the analysis of this data. This theory assumes that several risks compete against each other independently. Death of an AIDS patient is caused by any opportunistic infection (in biological terms, called “RISKS”) prevalent in the population. As we know, AIDS is a syndrome which curbs the immune system of the body and hence leaves the individual vulnerable to the opportunistic infections which on any other day would have been just a passing cloud. A co-infection is another illness one may get while having HIV. People who have HIV can also contract these illnesses viz. T.B [Doe, S. (1995), Moses, A.E., et.al. (2003)], Malaria, Hepatitis-B [Bonacini, M., et.al. (2004)], Hepatitis-C [Swami, O., et.al (2005)], Diarrhea, Bacterial Meningitis, Measles etc. We have identified some major opportunistic infections from the collected live data. as Tuberculosis(TB), Diarrhea(DH), Oral Disease(OR), Bacterial Meningitis(BM), Hepatitis (HP), Herpes(HR). To estimate the probability of death due to any risk, Competing Risk Theory provides several measures such as Crude, Net (Type-I, Type-II and Partially Crude probability of death). We have used SPSS software to estimate against each other independently. Data from two randomized controlled trials and several observational studies shows that initiating ART at CD4 < 350 cells/mm\(^3\) significantly reduces mortality, disease progression and the incidence of opportunistic diseases, especially TB and non-AIDS-defining conditions. [WHO report 2013: Consolidated ARV guidelines 2013].

2. DATA COLLECTION AND METHODS

We have collected a sample size \((n = 2057)\) of AIDS patients for 10 years (2004 - 2014) from RML hospital. Out of which 179 AIDS patients died due to TB, 68 due to Diarrhea, 35 due to Oral Disease, 23 due to Bacterial Disease, 22 due to Hepatitis, 35 due to any other diseases that are not much dominant for death of AIDS patients. Year wise reported AIDS patients and deaths are shown in Table 1. It was observed that % death has a decreasing trend for the period 2014-2014.

Table 1: Number of AIDS patients and deaths reported at ART centers in NCT Delhi

<table>
<thead>
<tr>
<th>Time interval ((x_i, x_{i+1}))</th>
<th>No. of AIDS patients surviving at the beginning of the time interval ((x_i, x_{i+1})) (l_i)</th>
<th>Number of Deaths in the time interval ((x_i, x_{i+1})) (d_i)</th>
<th>Deaths due to</th>
<th>% death</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TB)</td>
<td>(DR)</td>
<td>(OR)</td>
<td>(HR)</td>
<td>(BM)</td>
</tr>
<tr>
<td>2004-05</td>
<td>245</td>
<td>70</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>2005-06</td>
<td>292</td>
<td>74</td>
<td>36</td>
<td>13</td>
</tr>
<tr>
<td>2006-07</td>
<td>258</td>
<td>58</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>2007-08</td>
<td>254</td>
<td>48</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>2008-09</td>
<td>165</td>
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<td>5</td>
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</tr>
<tr>
<td>2010-11</td>
<td>157</td>
<td>24</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>2011-12</td>
<td>176</td>
<td>26</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>2012-13</td>
<td>192</td>
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</tr>
<tr>
<td>2013-14</td>
<td>168</td>
<td>18</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2057</td>
<td>400</td>
<td>179</td>
<td>68</td>
</tr>
</tbody>
</table>

Let, \(l_i\) = Number of AIDS patients alive at time \(x_i\)
\(d_i\) = Number of death of AIDS patients in the time interval \((x_i, x_{i+1})\)
\(p_i\) = Probability of survival of an AIDS patients in the time interval \((x_i, x_{i+1})\)
\(q_i\) = Probability of dying of an AIDS patient in the time interval \((x_i, x_{i+1})\) provided he has survived till \(x_i\)
\(D_j\) = Number of deaths of AIDS patients in the time interval \((x_i, x_{i+1})\) due to \(j\)th opportunistic infection where numbers \(j=1,2,3,4,5,6,7\) denote Tuberculosis(TB), Diarrhea(DR), Oral Disease (OR), Herpes (HR), Bacterial Meningitis (BM), Hepatitis (HP) and Other Disease (OD) respectively.
Figure-1 represents the percentage of deaths due to various opportunistic infections. It may be noted that highest percentage of deaths is due to TB i.e. 45% and 17% deaths due to Diarrhea, 9% deaths each due to OR,BM,OD respectively, 6% deaths due to Herpes and 5% due to Hepatitis infection have been identified among of total 400 deaths out of 2057 patients.

Figure-1: Pie diagram for deaths of HIV patients during 2004-2014

We obtained the estimate of Crude Probability of Death, Net Probability of Death-(type-I), Net Probability of Death-(type-II) and Partially Crude Probability of Death of AIDS patients as follows:

2.1. Crude Probability of Death- It is defined as the probability that any patient alive at time $x_i$ dies in the interval $(x_i, x_{i+1})$ due to a specific risk $R_\delta$ in the presence of all the risks operating in the population. It is denoted by $Q_{i\delta}$. An estimate of crude probability of death of AIDS patients is obtained by the formula

$$\hat{Q}_{ij} = \frac{D_i}{l_i}, \quad j = 1, 2, 3, 4, 5, 6, 7$$  \hspace{1cm} (1)

2.2. Net Probability of death (type-I) - It is defined as the probability that any patient alive at time $x_i$ will die in the interval $(x_i, x_{i+1})$ due to a specific risk $R_\delta$ when all other risks are off from the population. It is denoted by $q_{i\delta}$. An estimate of Net probability of death (type-I) is obtained by the formula

$$\hat{q}_{ij} = 1 - (\hat{p}_i)^{D_i}, \quad j = 1, 2, 3, 4, 5, 6, 7$$ \hspace{1cm} (2)

2.3. Net Probability of death(type-II): It is defined as the probability that any patient alive at time $x_i$ will die in the interval $(x_i, x_{i+1})$ due to any risk operating in the population when a particular risk $R_\delta$ (say) is off from the population (i.e. death due to any risk except $R_\delta$). It is denoted by $q_{i,\delta}$. An estimate of Net probability of death(type-II) is obtained by the formula

$$\hat{q}_{i,j} = 1 - (\hat{p}_i)^{1-D_i/j}, \quad j = 1, 2, 3, 4, 5, 6, 7$$ \hspace{1cm} (3)

2.4. Partially Crude probability of death: It is defined as the probability that any patient alive at time $x_i$ will die in the interval $(x_i, x_{i+1})$ due to a specific risk $R_\delta$, when any one or more risks ($R_j, j = 2, 3, ..., n, j \neq \delta$) are off from the population. An estimate of Partially Crude probability of death is obtained by the formula
where numbers 1,2,3,4,5,6,7 denote TB, DR, OR, HR, BM, HP and OD respectively. As per WHO guidelines, we identified all the reported AIDS patients and deaths who have CD4 cell counts ≤ 350 cells/mm$^3$ and >350 cells/mm$^3$ and all the reported cases were categorized with respect to major opportunistic infections.

Table 2: Number of AIDS patients and deaths with CD4 ≤ 350 and CD4 > 350 reported at ART centers in NCT Delhi

<table>
<thead>
<tr>
<th>Years</th>
<th>li</th>
<th>di</th>
<th>TB</th>
<th>Dir</th>
<th>Oral</th>
<th>Herpes</th>
<th>BM</th>
<th>Hep</th>
<th>OD</th>
<th>% death</th>
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<tbody>
<tr>
<td>2004-05</td>
<td>180</td>
<td>54</td>
<td>28</td>
<td>12</td>
<td>3</td>
<td>2</td>
<td>4</td>
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<td>3</td>
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<td>2005-06</td>
<td>196</td>
<td>56</td>
<td>28</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>5</td>
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<tr>
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<td>6</td>
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<td>17.14</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>11.11</td>
</tr>
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<td>285</td>
<td>142</td>
<td>54</td>
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<table>
<thead>
<tr>
<th>Years</th>
<th>li</th>
<th>di</th>
<th>TB</th>
<th>Dir</th>
<th>Oral</th>
<th>Herpes</th>
<th>BM</th>
<th>Hep</th>
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<td>1</td>
<td>3</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>10.15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>761</td>
<td>115</td>
<td>37</td>
<td>14</td>
<td>13</td>
<td>10</td>
<td>14</td>
<td>11</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows the number of death and alive patients year wise who have CD4 cell counts ≤ 350 cells/mm$^3$ and >350 cells/mm$^3$ for the period 2004-2014. It is noted from table 2 easily that % death of AIDS patients are much higher for patients with CD4 cell counts ≤ 350 cells/mm$^3$ cells as compared to those patients who has CD4 counts > 350 cells/mm$^3$. A possible reason could be that patients usually come to the ART center when they feel sick or any serious health related problem only and this sickness may be due to deteriorating immune system i.e. the symptoms of lower CD4 counts in the patients.

3. **ESTIMATION OF PROBABILITIES**

We have analyzed the data for the period of 10 years and probability of death for the AIDS patients with and without specification of CD4 count. Between the years 2004-2014, the Crude probability of death, Net probability of death (Type-I and Type-II) and partially crude probability of death with respect to CD4 counts have been estimated. These results have been tabulated and represented in the Tables and figures below. Table 3 shows the estimated probabilities of death without considering any specification and also for patients who have CD4 cell counts ≤ 350 as well as CD4 count > 350 cells/mm$^3$. Though all the three categories (overall, CD4≤350 and CD4>350) show the decreasing probabilities with respect to time, it may be noted that the mortality of AIDS patients with CD4 counts ≤350 is higher as compared to remaining two categories. A possible reason for this trend might be that lesser CD4 counts tend to weaken the immune system of AIDS patients hence the mortality is higher for this segment.
Table-3: Probabilities of death of AIDS patients without the specification and the variation of CD4 cell counts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( q_i )</td>
<td>0.2857</td>
<td>0.2534</td>
<td>0.2248</td>
<td>0.1890</td>
<td>0.1758</td>
<td>0.1733</td>
<td>0.1529</td>
<td>0.1477</td>
<td>0.1406</td>
<td>0.1071</td>
</tr>
<tr>
<td>( q_i ) when CD4≤350</td>
<td>0.3000</td>
<td>0.2857</td>
<td>0.2474</td>
<td>0.2022</td>
<td>0.1895</td>
<td>0.1882</td>
<td>0.1757</td>
<td>0.1714</td>
<td>0.1702</td>
<td>0.1111</td>
</tr>
<tr>
<td>( q_i ) when CD4&gt;350</td>
<td>0.2462</td>
<td>0.1875</td>
<td>0.1618</td>
<td>0.1579</td>
<td>0.1571</td>
<td>0.1538</td>
<td>0.1325</td>
<td>0.1127</td>
<td>0.1122</td>
<td>0.1014</td>
</tr>
</tbody>
</table>

The trend of these 3 segments are shown in the figure-2, where the upper dotted line shows the highest mortality of AIDS patients who have CD4 cell counts ≤ 350 cells/mm³. As we are aware that ART is doing remarkable job in the treatment of HIV/ AIDS patients and therefore the proportion of deaths shows decreasing trend. Further, ART is prolonging their life. From the analysis, we observed that death rate is declining in last few years due to awareness about the HIV infection and due to the improvement in the medical facilities.

![Prob. of deaths](image)

Figure-2: Graphical representation of Probabilities of death of AIDS patients with the variation of CD4 cell counts.

### 3.1 Estimation of Crude Probabilities

We have calculated Crude probability of death of AIDS patients due to various different risks available in the collected data. Table-4 shows all such probabilities with respect to 2 categories of CD4 counts. Here, we observed that average Crude probabilities of death of AIDS patients with CD4≤350 and CD4>350 due to TB are 0.982 & 0.048, DR are 0.0378 & 0.0193,’ OR are 0.0167&0.0175,’ HR are 0.0104&0.0134, BM are 0.0181&0.0188, HP are 0.0093&0.0146 and from OD are 0.0136&0.0208 in the presence of all other risks.

Table 4: Yearly Estimates of Crude probability of death of AIDS patients due to a specific cause.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>CD4≤350</th>
<th>CD4 &gt; 350</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>QI.1</td>
<td>QI.2</td>
</tr>
<tr>
<td>2004-05</td>
<td>0.1556</td>
<td>0.0667</td>
</tr>
<tr>
<td>2005-06</td>
<td>0.1429</td>
<td>0.0612</td>
</tr>
<tr>
<td>2006-07</td>
<td>0.1368</td>
<td>0.0421</td>
</tr>
<tr>
<td>2007-08</td>
<td>0.1124</td>
<td>0.0337</td>
</tr>
<tr>
<td>2008-09</td>
<td>0.0737</td>
<td>0.0421</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.0824</td>
<td>0.0353</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.0676</td>
<td>0.027</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.0857</td>
<td>0.0286</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.0851</td>
<td>0.0213</td>
</tr>
<tr>
<td>2013-14</td>
<td>0.0404</td>
<td>0.0202</td>
</tr>
<tr>
<td>Ave</td>
<td>0.0982</td>
<td>0.0378</td>
</tr>
</tbody>
</table>

On the basis of these results, we conclude that Crude probability of death of AIDS patients with CD4 cell counts ≤ 350 due to TB & DR is higher as compared to CD4 cell counts > 350. Figure-3 clearly shows comparison between the Crude probabilities of death of AIDS patients for both the categories of CD4 counts. It can be said that TB is most dominant risk as compared to other risks in the population and hence TB is identified as major risk of AIDS patients in Delhi and NCR.
3.2 Estimation of Net (Type-I) Probabilities

we have calculated the average estimate of Net probabilities (Type-I) for all the categorized risks and Table-5 shows that the Net probabilities (Type-I) of death of AIDS patients due to TB with CD4 ≤ 350 and CD4 > 350 when other diseases are eliminated from the population are 0.1045 & 0.0508, due to DR when other diseases are eliminated are 0.0418 & 0.0208, OR when other diseases are eliminated are 0.0186 & 0.0198, HR when other diseases are eliminated are 0.0115 & 0.0145, BM when other diseases are eliminated are 0.0201 & 0.0203, HP when other diseases are eliminated are 0.0103 & 0.0157 and OD when other diseases are eliminated are 0.0152 & 0.0224. Here, it is observed that mortality is higher due to opportunistic infections TB, DR and OD. More specifically, it is almost double when CD4 ≤ 350 as compared to CD4>350 count over the period of 2004-2014. Further, Net probability of death due to OR and BM seems almost same for both kinds of CD4 counts. The average estimate of Net probabilities (Type-I) due to HP and BM are slightly lower for CD4 ≤ 350 as compared to CD4> 350 counts for this period. With these observations, we may conclude that for lower CD4 counts, mortality of AIDS patients is higher in almost all the opportunistic infections.

Table-5: Yearly Estimate of Net probability of death (Type-I) of AIDS patients

<table>
<thead>
<tr>
<th>Years</th>
<th>q_{i1}</th>
<th>q_{i2}</th>
<th>q_{i3}</th>
<th>q_{i4}</th>
<th>q_{i5}</th>
<th>q_{i6}</th>
<th>q_{i7}</th>
<th>q_{i1}</th>
<th>q_{i2}</th>
<th>q_{i3}</th>
<th>q_{i4}</th>
<th>q_{i5}</th>
<th>q_{i6}</th>
<th>q_{i7}</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>0.1688</td>
<td>0.0762</td>
<td>0.0196</td>
<td>0.0131</td>
<td>0.0261</td>
<td>0.0131</td>
<td>0.0196</td>
<td>0.0845</td>
<td>0.0516</td>
<td>0.0347</td>
<td>0.0175</td>
<td>0.0347</td>
<td>0.0175</td>
<td>0.0347</td>
</tr>
<tr>
<td>2005-06</td>
<td>0.1548</td>
<td>0.0696</td>
<td>0.0296</td>
<td>0.0119</td>
<td>0.0296</td>
<td>0.0060</td>
<td>0.0179</td>
<td>0.0882</td>
<td>0.0115</td>
<td>0.0228</td>
<td>0.0115</td>
<td>0.0228</td>
<td>0.0115</td>
<td>0.0340</td>
</tr>
<tr>
<td>2006-07</td>
<td>0.1455</td>
<td>0.0472</td>
<td>0.0180</td>
<td>0.0120</td>
<td>0.0239</td>
<td>0.0066</td>
<td>0.0180</td>
<td>0.0316</td>
<td>0.0316</td>
<td>0.0316</td>
<td>0.0159</td>
<td>0.0159</td>
<td>0.0159</td>
<td>0.0159</td>
</tr>
<tr>
<td>2007-08</td>
<td>0.1180</td>
<td>0.0370</td>
<td>0.0125</td>
<td>0.0062</td>
<td>0.0125</td>
<td>0.0248</td>
<td>0.0321</td>
<td>0.0282</td>
<td>0.0142</td>
<td>0.0282</td>
<td>0.0142</td>
<td>0.0282</td>
<td>0.0142</td>
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<td>2008-09</td>
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<td>0.0456</td>
<td>0.0231</td>
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<td>0.0231</td>
<td>0.0116</td>
<td>0.0116</td>
<td>0.0748</td>
<td>0.0154</td>
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<td>0.0154</td>
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<td>0.0154</td>
<td>0.0154</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.0872</td>
<td>0.0383</td>
<td>0.0257</td>
<td>0.0129</td>
<td>0.0129</td>
<td>0.0129</td>
<td>0.0129</td>
<td>0.0646</td>
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<td>0.0166</td>
<td>0.0166</td>
<td>0.0166</td>
<td>0.0166</td>
<td>0.0166</td>
</tr>
<tr>
<td>2010-11</td>
<td>0.0716</td>
<td>0.0293</td>
<td>0.0148</td>
<td>0.0148</td>
<td>0.0293</td>
<td>0.0148</td>
<td>0.0148</td>
<td>0.0504</td>
<td>0.0128</td>
<td>0.0128</td>
<td>0.0128</td>
<td>0.0255</td>
<td>0.0128</td>
<td>0.0128</td>
</tr>
<tr>
<td>2011-12</td>
<td>0.0897</td>
<td>0.0309</td>
<td>0.0207</td>
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<td>0.0104</td>
<td>0.0104</td>
<td>0.0104</td>
<td>0.0148</td>
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<td>0.0148</td>
<td>0.0148</td>
<td>0.0148</td>
<td>0.0148</td>
<td>0.0148</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.0891</td>
<td>0.0231</td>
<td>0.0116</td>
<td>0.0116</td>
<td>0.0231</td>
<td>0.0116</td>
<td>0.0116</td>
<td>0.0424</td>
<td>0.0108</td>
<td>0.0108</td>
<td>0.0108</td>
<td>0.0108</td>
<td>0.0108</td>
<td>0.0214</td>
</tr>
<tr>
<td>2013-14</td>
<td>0.0419</td>
<td>0.0212</td>
<td>0.0107</td>
<td>0.0107</td>
<td>0.0107</td>
<td>0.0107</td>
<td>0.0107</td>
<td>0.0152</td>
<td>0.0152</td>
<td>0.0152</td>
<td>0.0152</td>
<td>0.0152</td>
<td>0.0152</td>
<td>0.0152</td>
</tr>
<tr>
<td>Ave.</td>
<td>0.1045</td>
<td>0.0418</td>
<td>0.0186</td>
<td>0.0115</td>
<td>0.0201</td>
<td>0.0103</td>
<td>0.0152</td>
<td>0.0508</td>
<td>0.0208</td>
<td>0.0189</td>
<td>0.0145</td>
<td>0.0203</td>
<td>0.0157</td>
<td>0.0224</td>
</tr>
</tbody>
</table>

These differences can also be seen clearly through Figure-4 and it is also observed through the Bar diagram that TB has highest Net (Type-I) probability of death as compared to other risks. Net probability (Type-I) of death is higher with CD4 cell counts ≤ 350 cells/mm³ than >350 cell counts and Net (Type-I) probabilities do also reflects that TB has much higher impact on AIDS patients.

3.3 Estimation of Net (Type-II) Probabilities

We have estimated the Net probability of death (type II) of AIDS patients i.e. death of AIDS patients due to any other disease when a particular risk is eliminated from the population with respect to the variation of CD4 cell counts. Table-6 shows such kind of all the Net probability of death (type II) of AIDS patients. We observed that the average of the estimated Net probability (Type-II) with CD4 ≤ 350 and CD4 > 350 (type II) are 0.1210 & 0.1072 when TB is eliminated, when DR eliminated is 0.1738 & 0.1345 , when OR eliminated is 0.1875 & 0.1362 , when HR is eliminated 0.1929 & 0.1399, when BM is eliminated 0.1867 & 0.1350, when HP eliminated 0.1929 & 0.1388 and OD eliminated is 0.1880 & 0.1331 . It is also noted that Net (Type-II) probabilities of AIDS are lesser with CD4
counts > 350 as compared to those patients who have CD4 cell counts ≤ 350. Which shows bit opposite trend with the less survival with CD4 counts ≤ 350. But, when risk TB is eliminated the average of estimated Net probability of death (type-II) is estimated the least. This again pointed out towards TB as a major risk for AIDS patients in both the cases of CD4 cell counts.

![Graphical representation of Net probability of death (Type-I) of AIDS patients due to TB, DR, OR, HR, BM, HP and OD](image)

Figure 4: Graphical representation of Net probability of death (Type-I) of AIDS patients due to TB, DR, OR, HR, BM, HP and OD

Table-6: Yearly Estimate of Net probability of death (type-II) of AIDS patients

<table>
<thead>
<tr>
<th>YEARS</th>
<th>CD4 ≤ 350</th>
<th>CD4 &gt; 350</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>q1</td>
<td>q2</td>
</tr>
<tr>
<td>2004-05</td>
<td>0.1718</td>
<td>0.2444</td>
</tr>
<tr>
<td>2005-06</td>
<td>0.1587</td>
<td>0.2422</td>
</tr>
<tr>
<td>2006-07</td>
<td>0.1367</td>
<td>0.2096</td>
</tr>
<tr>
<td>2007-08</td>
<td>0.1110</td>
<td>0.1716</td>
</tr>
<tr>
<td>2008-09</td>
<td>0.1159</td>
<td>0.1596</td>
</tr>
<tr>
<td>2009-10</td>
<td>0.1134</td>
<td>0.1618</td>
</tr>
<tr>
<td>2010-11</td>
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<td>2011-12</td>
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</tr>
<tr>
<td>Ave</td>
<td>0.1210</td>
<td>0.1738</td>
</tr>
</tbody>
</table>

Figure 4 shows the graphical representation of Net probability of death (type-II) of AIDS patients when TB, DR, OR, HR, BM, HP and OD eliminated respectively with respect to CD4≤350 and CD4 > 350. Bar diagram clearly show the results.

3.4. Estimation of Partially Crude probability with CD4 ≤ 350 and CD4 > 350:

We have estimated partially crude probabilities of death due to various risks when one or more risks were eliminated from the population, we observe that TB and Diarrhea were dominant over other risks so we have calculated the probabilities due to these two opportunistic infections with the effect of rest of the other risks.

Table-7 shows the average estimate of Partially crude probabilities of death of AIDS patient due to TB with CD4 counts ≤350 & >350 when DR eliminated are 0.0912 & 0.0485, OR eliminated 0.0903& 0.0484, OD eliminated are 0.0899 & 0.0483, BM eliminated are 0.0904&0.0485, HR eliminated are 0.0899 & 0.0483 and OD eliminated are 0.0902 & 0.0485.Similarly, the average estimate of Partially crude probabilities of death of AIDS patient due to DR with CD4 counts ≤ 350 & >350 when TB is eliminated are 0.0358 & 0.0198, OR eliminate are 0.0342 & 0.0195, HR eliminated are 0.0341 & 0.0194, BM eliminated are 0.0342 & 0.0195, HP eliminated are 0.0340 & 0.0194 and OD eliminated are 0.0342 & 0.0195.
Manoj Kumar Varshney et al.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Qi1.2</th>
<th>Qi1.3</th>
<th>Qi1.4</th>
<th>Qi1.5</th>
<th>Qi1.6</th>
<th>Qi1.7</th>
<th>Qi2.1</th>
<th>Qi2.3</th>
<th>Qi2.4</th>
<th>Qi2.5</th>
<th>Qi2.6</th>
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</thead>
<tbody>
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<td>2004-05</td>
<td>0.1466</td>
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<td>0.1425</td>
<td>0.1431</td>
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<td>0.0651</td>
</tr>
<tr>
<td>2005-06</td>
<td>0.1429</td>
<td>0.1411</td>
<td>0.1399</td>
<td>0.1411</td>
<td>0.1396</td>
<td>0.1408</td>
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<td>0.0510</td>
<td>0.0505</td>
<td>0.0510</td>
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</tr>
<tr>
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<td>0.1200</td>
<td>0.1205</td>
<td>0.0456</td>
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<td>0.0978</td>
<td>0.0974</td>
<td>0.0982</td>
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<td>0.0339</td>
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</tr>
<tr>
<td>2008-09</td>
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<td>0.0790</td>
<td>0.0790</td>
<td>0.0341</td>
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</tr>
<tr>
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<td>0.0803</td>
<td>0.0302</td>
<td>0.0293</td>
<td>0.0292</td>
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<tr>
<td>2010-11</td>
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<td>0.0664</td>
<td>0.0664</td>
<td>0.0667</td>
<td>0.0667</td>
<td>0.0664</td>
<td>0.0227</td>
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<td>0.0221</td>
</tr>
<tr>
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<td>0.0664</td>
<td>0.0664</td>
<td>0.0664</td>
<td>0.0666</td>
<td>0.0273</td>
<td>0.0267</td>
<td>0.0266</td>
<td>0.0266</td>
<td>0.0266</td>
<td>0.0267</td>
</tr>
<tr>
<td>2012-13</td>
<td>0.0764</td>
<td>0.0762</td>
<td>0.0762</td>
<td>0.0764</td>
<td>0.0762</td>
<td>0.0764</td>
<td>0.0197</td>
<td>0.0190</td>
<td>0.0190</td>
<td>0.0191</td>
<td>0.0190</td>
<td>0.0191</td>
</tr>
<tr>
<td>2013-14</td>
<td>0.0312</td>
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<td>0.0311</td>
<td>0.0311</td>
<td>0.0311</td>
<td>0.0188</td>
<td>0.0186</td>
<td>0.0186</td>
<td>0.0186</td>
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</tr>
<tr>
<td>Average</td>
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Figure 5: Graphical representation of Net probability of death (Type-I) of AIDS patients due to TB, DR, OR, HR, BM, HP and OD.

Here we observed that Partially crude probability of death due to TB has almost no effect after eliminating one or more risks respectively. Which shows that the risk TB is much more dominant over all other prevalent risks in the population of AIDS patient during the period of 2004-2014 and also for Diarrhea, the mortality is also similar after eliminating other risks but lesser as compared to risk TB.
Table 7: Yearly Estimate of Partially Crude probability of death of AIDS patients due to TB and DR with CD4 count ≤ 350 and > 350 when one and more risks eliminated respectively.

Figure-6 shows the graphical behavior of Partially crude probability of death of AIDS patients due to TB, DR.OR.HR,BM,HP and OD Hepatitis-B, Diarrhea, Bacterial Meningitis with CD4 counts ≤ 350 and > 350 when other one or more risks eliminated respectively.

Figure-6: Graphical representation of Partially Crude probability of death of AIDS patients due to TB when one and two risk eliminated respectively

Hence we observed that Partially crude probability of death due to TB and DR when one or more risks eliminated, are very much alike. We can conclude that presence or absence of any other risk has approximately no effect on probability of death of AIDS patients excepting the risk TB and the Partially crude probabilities are higher for CD4 counts ≤ 350 than CD4 >350.

4. DISCUSSION

The strength of this study is to estimate mortality of AIDS patients with respect to the varying CD4 cell counts and other covariates for the collected live data at an ART center. Study shows that a lower CD4 cell counts is associated with a higher risk of dying of AIDS patients. CD4 Cell counts are considered one of the most important predictor to estimate the mortality of AIDS patients. The study shows a strong relationship between CD4 cell counts and the mortality of AIDS patients. Results also highlights the substantially higher risks of mortality faced by individuals confected by various coinfections. The competing risks methods permitted a rich and detailed examination of mortality. The probability of death of AIDS patients without any specification of cause is highest in the year (2004-04) while lowest in the year (2013-14) and has the tendency of decreasing as time increases. It was also observed that the number of patients were increased in the year 2006-07 but the percentage of death has a decreasing trend over the period 2004-2014. It may be due to introducing Anti–Retroviral Therapy, better medical facilities and awareness about HIV/AIDS in India.

The average of estimated Crude probability of death of AIDS patient due to Tuberculosis & Diarrhea is higher with CD4 ≤ 350 than those patients who were with CD4 count > 350 for the given period of time. The average of Net probability of death (type-I) and Net probability of death(type-II) show that opportunistic infection TB and Diarrhea have higher impact on survivability of AIDS patients with CD4 ≤ 350 as compared to other opportunistic infections. Partially Crude probability of death shows that mortality of AIDS patients is significantly affected by the variation of CD4 cell count and opportunistic infection. It also shows that presence or absence of other risks has approximately no effect on probability of death due to TB and Diarrhea for AIDS patients with both the segments of CD4 cell counts.

Finally, it can be concluded that chance of death of AIDS patient is higher when CD4 ≤ 350 as compared to those patients who has CD4 cell counts >350 and also opportunistic infections TB and Diarrhea have maximum impact on the mortality of AIDS patients in National Capital Territory, Delhi during the period of 2004-2014. Hence CD4 plays important role in the estimation of mortality as well as in the treatment of AIDS patients.

5. FUTURE TRAJECTORIES

This study was limited to one ART center, hence the larger population (more than one state) may be considered to analyze the data for AIDS patients suffering with other dreaded opportunistic infections. The occurrence of tuberculosis (TB), Human immunodeficiency virus (HIV) and Hepatitis infections in the same patient poses unique clinical and public health challenges because medication to treat TB and HIV are hepatotoxic [Wanitchaya, K., et.al.(2008)] and need for further epidemiologic and clinical studies to optimize the magnitude of this complicated medical condition.
6. ACKNOWLEDGEMENT
The authors are thankful to medical superintendent and Director of ART center of Ram Manohar Lohia Hospital, Delhi for consulting the patients and providing the live data for this research.

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EFFECTIVE M-LEARNING ON INSTRUCTION THROUGH A
LEARNING MANAGEMENT SYSTEM

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ABSTRACT

ICT, Intranets, extranets, and internet are growing day by day, and are becoming eminent technologies. Moodle, Blackboard, WebCT also known as LMS (Learning Management Systems) are widely used for instruction in education. Today’s learning is not limited to the classroom only. Mobile learning (M-learning) is an ideal technique for delivering the content to learners at the time of their need. This study has revealed the effectiveness of M-learning on instruction using Moodle (LMS), to the students taking a course “Basic Computing Skills” offered at Sultan Qaboos University (SQU), Sultanate of Oman, for General Foundation Program. The course was designed as a blended learning approach and the material was digitally used through Moodle’s webpages, designed for the course along with face to face teaching. Students had used their smart phones and portable devices for accessing the Course website. The findings revealed that students had a little exposure to M-learning at the beginning of the course, and had appreciated M-learning technique, after testing it.

Keywords: M-learning, Moodle, LMS, Students Attitudes, Blended Learning.

1. INTRODUCTION

Digital community is increasing day by day and as a result we are expanding our global electronic village. Learning Management Systems (LMS) have become famous for instruction and learning in the education. Moodle is one of the well-known Learning Management System working with interlinked e-documents. Oman is extremely determined to advance its educational system. Sultan Qaboos University (SQU) is serving thousands of male and female students as the national university. SQU staff and students are using Moodle, a Learning Management System for effective teaching and learning, and getting positive benefits. As claimed by (Klobas & McGill, 2010; Porter, 2011) participants involved through LMS had significant benefits and positive effects on their learning.

SQU staff is mostly utilizing the Moodle in the e-learning environment, with fixed computer locations. Today, the restrictions of learning through fixed areas can be switched to Mobile Learning and the learners can get the help at the time of their need. Mobile learning is an ability that allows learning through moving and changing the position of a learner from place to place while using mobile devices for sending, receiving and using a range of digital information sources (Chad, 2014). Keeping in view enormous benefits of M-Learning, this research study was experimented through M-learning environment for the purpose of instruction. Firstly, we had introduced Moodle to the students studying the course “Basic Computing Skills”, through using the electronic material of the course, and then requested them to use their smart phones for accessing e-mails, e-materials, and chat sessions through Moodle etc. along with face to face instruction (blended learning), and we had tested and compared the effects of M-Learning using Moodle through their feedback.

2. BACKGROUND OF THE STUDY

Sultan Qaboos University is the development of the declaration announced by His Majesty Sultan Qaboos Bin Said; The Sultan of Oman. 1986 was the year, when the first batch of students was registered at SQU. Overall the campus of SQU symbolizes the rich heritage of Oman and Islam (Sultan Qaboos University, 2015). SQU has nine colleges, and almost all the colleges at SQU are using the LMS Moodle, and Center for Educational Technology (CET) is trying their best to offer the services for the effective and maximum use of Moodle, for modernizing the teaching and learning process, and all the faculty members at SQU are determined towards the maximum utilization and output of the LMS Moodle. Mostly the instruction at SQU is through Moodle, with in the environment of e-learning along with fixed location of computers in the labs or at the students’ accommodation. We had tested Mobile learning environment in the form of blended learning, to give an opportunity to the learners, to do their learning without any restriction of the fixed areas. The major benefit of mobile learning is that the learner is mobile and is not restricted to a specific location (Chad, 2014). And students used their smart phones and portable devices to access the digital material. M-Learning is the learning through personal electronic devices towards various electronic contents (Crompton, 2013). The assessment of performance and effects of any electronic tool can be made on the factors like; Comfortability, essentiality or importance, feel at ease or
friendly, help of e-tool in understanding and learning towards a specific area or goal (Syed & Manzur 2006; Syed, 2006; Rob, 2014).

There are lots of benefits for using E-mails and Chatting. E-mail is very informal and casual that enables to write a message with in fewer amounts of time, and without worrying about grammatical mistakes (Yates, Orlikowski, 1992). E-mail is as essential as any other medium of communication like phone, fax, paper, or mail (Quaresma et al., 2013). Chat rooms/Chatting encourage thoughtful conversation among the learners or participants, and a useful tool for knowledge and learning (Whyte, 2000; Insinnia & Eileen, 2004; Mynard & Troudi, 2008). Online chat sessions are useful in improving and refining the outcomes of the participants (Dowling & Rickwood, 2014).

Keeping in view huge benefits of E-mails, chatting and e-materials, this paper had addressed in analysing the overall effects of the usage of these electronic communications through M-Learning using Moodle.

3. PURPOSE OF STUDY

The purpose of this research was to explore the students’ attitude on the use of M-learning using Moodle and its effect on the students’ attitudes, students understanding and learning, and their likings towards the mode of instruction, those had a little knowledge of IT and LMS Moodle, towards the e-course material of the subject “Basic Computing Skills”.

4. WHAT IS MOODLE?

Moodle is platform for educators, leaners and administrator that provide a secure, robust and an integrated system, and users can create their own personalized learning environments (Moodle, 2015). Moodle Instructors can organize and control course contents and its delivery using Moodle as an integrated system (Brooks-Young, 2008). Moodle is a good quality platform that supports in electronic learning (Höbl, Welzer, 2010).

5. METHODOLOGY

This study had been conducted on the students, studying the course Basic Computing Skills for General Foundation Program (a bridging program). A course website was created using Moodle and e-materials were made available on the website, in combination with traditional face-to-face instruction. A questionnaire was used to gather the student responses, using ten questions, for three hundred and twenty (320) students. Three key domains were established related to Attitudes towards m-Learning using Moodle, M-Learning using Moodle helps in understanding and learning the course, and helps in exam preparation, and students’ favourite mode of learning through Instructor only, through m-learning using Moodle or both. Data was collected in two phases (Before and After). Before was the initial phase and data collection at this stage was during the beginning of the course when students didn’t use the M-learning using Moodle, and gave their feedback. After was the phase when students gave their feedback at the end of the course after using m-learning. Likert scale was used to collect the feedback for each item, ranging from 1 to 5, where 1-Strongly Disagree, 2-Disagree, 3-Uncertain OR (never used Moodle before), 4-Agree, 5-Strongly Agree. The e-materials used in the study were course outline, presentations, and additional exercises for practising, course helping e-materials, e-notes, e-mails, chat sessions, and useful links. Instructors and students were regularly involved in e-communications for sharing and exchanging the information, ideas, raised questions and their answers through E-mails (Asynchronous mode) and Moodle’s Online Chat Sessions (Synchronous mode). As a reply of their questions and requests, required material and information was made obtainable on the course website. Chat sessions were controlled and revised by the instructors and greatly participated by the students, outside of regular class timings. As a reply of their requests or questions e-materials using PDF Files, MS Word, MS Power Point, useful website links were uploaded on the course website. An assessment was made at the initial phase: “Before starting the course” and then the next assessment was “After the course”, to differentiate any recognizable difference on students’ attitudes towards m-learning through Moodle, its effects on learning and understanding, and students likings in assessment with Instructor vs m-learning through Moodle.

Face to face instruction was conducted in the computer labs, with each lab having 32 computers with Microsoft Office. M-learning was done through students’ smart phones, tablets and portable devices of their choice. Plain statistical analysis had been used to assess the gathered data, by comparing the group means to analyse the amount of change from “Before” to “After” phase.

5.1 Attitude toward M-Learning Using Moodle

Table 1 contains the mean of study for the students’ attitude toward m-learning using Moodle at Before and After phases along with the size of change, and is presented in Fig. 1. The Mean of study for the variables ‘Friendly’, ‘Comfortable’ and ‘Essential’ was low at the beginning of the course, whereas in ‘After’ phase students responded with a big size of change with (2.45), (1.81) and (2.47) respectively. This thing shows that the students’
knowledge or understanding about m-Learning using Moodle was little Before the course. But after the use of m-learning it was significant that the students’ attitude towards m-Learning using Moodle was very positive and considered the m-learning as friendly, comfortable and essential for learning.

Table 1: Attitude toward m-Learning using Moodle

<table>
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<th>Dependent Variables</th>
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<tr>
<td></td>
<td>Before</td>
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<tr>
<td>Friendly</td>
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<td>Essential</td>
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<td>4.71</td>
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Fig. 1 Attitudes towards m-Learning using Moodle

5.2 Learning and Understanding Through M-Learning Using Moodle

Mean of Table 2 shows that in beginning, the students’ overall opinion and understanding toward the m-Learning using Moodle as a learning tool was very low for the variables: m-Learning helps in ‘Understanding’ the course, ‘Learning’ the course and ‘Helps in Exams Preparation’. But, after using m-Learning, when students were asked at an After phase, they valued the effect of m-Learning using Moodle with a very positive response by a huge size of change (After-Before) for the variables, with the values (2.20), (2.21) and (2.48) respectively. The means of the study along with the size of change are presented in Table 2 and graphically shown in Fig. 2.

Table 2: Learning and Understanding through m-learning using moodle

<table>
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<th>Dependent Variables</th>
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<td>Help in Exams Prepar</td>
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Fig. 2: Learning and Understanding through m-Learning using Moodle

5.3 Students Likings – Mode of Instruction

The means of study along with the size of change for the phases Before and After are presented in Table 3, and graphically shown in Fig. 3. Before starting the course, students were asked to give their opinion about their favorite mode of instruction ‘Instructor Only’, ‘m-Learning using Moodle only’ or both ‘Instructor and m-Learning using Moodle’. The rated Mean by students in the beginning for the variable ‘Instructor and m-Learning using Moodle’ was rated very low with the Mean value (M=1.82). But, after using the m-Learning at After phase they have changed their opinion and rated the variable ‘Instructor and m-Learning using Moodle’ with a high Mean containing the value (M=4.79) with a size of change ‘After – Before’ (2.98).
Table 3: Students Likings – Mode of Instruction

<table>
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<th>Dependent Variables</th>
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<tr>
<td>m-learning using Moodle only</td>
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</tr>
<tr>
<td>Instructor and m-learning using Moodle</td>
<td>1.82</td>
<td>4.79</td>
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</table>

![Image](image.png)

Fig. 3: Mode of Instruction

Student attitudes toward m-learning using Moodle for the key areas “Friendly”, “Comfortable”, and “Essential” were positive (with a Before-After change of 2.45, 1.81, 2.47 respectively), and their feedback towards the key areas “Understanding”, “Learning”, and “Helped in Exams Preparations”, were (with a Before – After change of 2.20, 2.21, and 2.48 respectively), and the first key area of students likings Instructor Only was decreased with -1.08 whereas, the key area “Instructor and m-learning using Moodle” was increased by 2.98.

6. SUMMARY AND CONCLUSION

Students those were introduced to m-Learning using Moodle had positive attitude toward m-Learning, and consecutively had enhanced learning and understanding of their course. As the whole world is increasingly establishing connections and joining the digital society, day by day, and the digital technologies are becoming prominent, therefore the education sector is also relishing the benefits of technology, and now a days learning is not only restricted to the traditional face-to-face mode. Mobile learning is a best method for providing the content to learners according to the time of their needs. Therefore additional use of m-Learning using Moodle, along with traditional face-to-face instruction can positively affect the learning and understanding of students. Study shows that majority of the students’ recognized that m-Learning is friendly, comfortable and essential part of the course, favored face-to-face instruction supported with m-Learning using Moodle including the activities like online e-materials, exchanging E-mails, chat sessions, and useful links, etc. Mobile learning provides an opportunity to reach the digital content from any location with successful learning and enormous benefits (Scott et al., 2015), is exactly in agreement with our study results. The most favorable thing students highlighted is the organized collection of all the learning e-material in one place like Moodle, and prompt feedback of their e-queries through m-Learning devices on the course website.

REFERENCES


FENN: FUZZY INTEGRATED EXTENDED NEAREST NEIGHBOUR CLASSIFICATION ALGORITHM FOR WEB PAGE RETRIEVAL

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ABSTRACT

Due to the continuous growth of web page collection in the World Wide Web, the finding of relevant and useful document for the user is a challenging task now-a-days. Literature presents different techniques for web page retrieval based on keyword-matching mechanism. In order to alleviate the issue behind the keyword matching in web page retrieval, a new classifier-based technique is developed in this paper using logarithmic similarity measure. Here, a new classifier, called FENN classifier is developed by including the fuzzy concept in the extended nearest neighbour classifier. The proposed FENN classifier classifies the input query to the relevant category and the document related to the category is retrieved from the input database. The developed FENN classifier is experimented with the web page database collected through five benchmark queries and the quantitative performance is analyzed using precision, recall and f-measure with the existing ENN and KNN classifier. From the results, we proved that the proposed FENN classifier obtained the maximum f-measure of 93.8% as compared with the existing algorithms.

Keywords: Information retrieval, Web pages, k-NN classification, Similarity, F-measure.

1. INTRODUCTION

Information retrieval [5, 12] is more commonly called as document retrieval and its goal is to recover the relevant documents from the huge collection of documents based on the query given by the user. Before the invention of Web, the information retrieval systems were used by librarians in libraries. For these retrieval systems, the algorithm was solely based on the analysis of the words in the documents. Research in the field of information retrieval is going on for past several years which develops and refines many techniques which are exclusively word-based. Due to the tremendous increase of Web pages in the internet, the researchers are paying more attention to find more efficient web page retrieval algorithms [16].

Among the various web page retrieval methods, the search engines are used to get the query from the user and recover the required information from the Web. Relevance ranking at the document level is a concept used in information retrieval for the past several years and this becomes the key task of the present Web search engines [14]. Classification of page content in the web is important to focused crawling, assisted development of web directories, topic-specific web link analysis, and analysis of the topical structure of the Web. The quality of web search is enhanced by the web page classification [13]. It also helps in systematic retrieval of documents by removing unsuitable web pages and it manages the World Wide Web (WWW). Usually, the domain experts perform this task manually. As the WWW is growing at a faster rate, the manual categorization cannot match with the speed of the growth of the web. So, there is a need to find automatic web page categorization. Furthermore, automatic web page categorization is faster and cheaper than manual categorization [15].

In this paper, we propose a new classifier called, FENN to perform the web page retrieval. The web page retrieval is performed using three important steps. In the first step, important keywords are extracted after performing stop word removal, stemming and frequency computation. In the second step, the feature library is constructed for finding the neighbour documents. In the third step, for the user query, the input documents are matched with this query to find the relevant document using FENN classifier which is newly developed by considering the fuzzy weightage for neighbours and neighbours of neighbours. The paper is organized as follows: Section 2 presents the existing Extended nearest neighbour method and section 3 presents the proposed fuzzy integrated extended nearest neighbour classification algorithm for web page retrieval. Section 4 presents the experimental results and section 5 concludes the paper.

2. ENN: EXTENDED NEAREST NEIGHBOUR METHOD

Extended Nearest Neighbor (ENN) [6] is a classification method which utilizes the maximum gain of intra-class coherence to predict the input patterns. In the traditional K-nearest neighbour (KNN) classifier [3, 7, 9, 17], group membership is estimated by using only the nearest neighbours of the test samples. But in ENN method, the estimation is done by considering, who is the nearest neighbour of test samples and who consider the test sample as their nearest neighbours. ENN iteratively assume all the possible class memberships of the test samples and utilize
the generalized class-wise statistics from all training data. It learns from the global distribution and improves the pattern recognition performance and it provides good techniques for several data analysis applications.

Let assume that \( W \) be the input database and \( Q \) be the input sample to be classified. The class label of the input sample \( Q \) can be found out using the following equation. The \( l \) th class have the maximum value is the output class of the input sample \( Q \).

\[
C = \text{Arg} \left\{ \max_{i=1}^{n} (C_i) \right\}
\]

...{(1)}

Where, the value of \( C_i \) is found out using the neighbour of neighbours. At first, the input data sample \( Q \) is matched with all the data sample of the input database using Euclidean distance and \( k \) set of samples are taken further those who are having minimum distance and then, the distance is matched for every taken sample with the database and again selects \( k \) set of samples. Finally, the class information of the selected samples is checked and the class belonging to the maximum number of samples is considered as the class for the input data sample.

\[
C_i = \frac{1}{N_i,k} \sum_{q \in w_i} \sum_{r \in l} E_{rr}(q,w)
\]

...{(2)}

Where, \( N_i \) is the number of data samples belonging to the \( l \) th class, \( r \) is number of neighbours of the neighbours. \( k \) is the number of neighbours to be considered for classification. The values of \( E_{rr}(q,w) \) is found out using the following equation.

\[
E_{rr}(q,w) = \begin{cases} 1; & \text{if } q \not\in w_i \& N_{rr}(Q,W \in w_i) \\ 0; & \text{otherwise} \end{cases}
\]

...{(3)}

**Drawbacks:** The major drawbacks in the ENN classifier is that it consider the neighbours of neighbours for classifying the data sample but the class information of the first level neighbours is not effectively included into the mathematical formula. The considerations of both the neighbours’ samples which mean the neighbours of the input samples and neighbours of the neighbours of the input data samples can only improve the classification. Also, the matching of the input data sample with the database is performed using the Euclidean database. The Euclidean distance considers the deviation of the two samples by doing the subtraction. But, in the web page retrieval, the page dissimilarity should utilize the frequency of the keywords and the overall availability of the keywords in the databases. So, the Euclidean distance should be modified for the web page retrieval when ENN classifier is incorporated into the web page retrieval.

**3. PROPOSED FUZZY INTEGRATED EXTENDED NEAREST NEIGHBOUR CLASSIFICATION ALGORITHM FOR WEB PAGE RETRIEVAL**

This section presents the proposed fuzzy integrated extended nearest neighbour classification algorithm for web page retrieval. At first, web page database is given as input to the pre-processing steps which performs stop word removal and stemming. Then, the feature library is constructed using the keywords extracted and the proposed FENN classifier is performed to find the category of the input query and a list of document are retrieved using the category. Here, FENN classifier is newly proposed by modifying the existing ENN classifier with the fuzzy membership formulae. The block diagrams of the proposed FENN classifier is shown in figure 1.

**3.1 Extraction of Important Keywords**

The first step in the proposed web page retrieval is the extraction of keywords from every web page. Let assume that the input database \( W \) have the \( N \) number of web pages which is stored in HTML format.

\[
W = \{P_i; \ 0 < i < N\}
\]

...{(4)}

The html web page is read out and the tags are removed from the web pages. Subsequently, we apply the stop word removal process [2] which removes the stop words like, ‘a’, ‘an’, ‘the’, ‘as’, ‘on’, ‘like’ and so on. Once stop words are removed from the web pages, the stemming algorithm [4] is applied to covert the keywords to its root form. For example, the words like, ‘performed’, ‘obtaining’ are converted to ‘perform’ and ‘obtain’. Then, the extracted keywords of every web page are used to find the frequency in the web page itself. The keywords which are more frequent in its document is taken further for constructing the feature library.

\[
P_i = \{w_j; \ 0 < j < M\}
\]

...{(5)}
### 3.2 Constructing Feature Library

The next step is to construct the feature library for performing the retrieval of web pages by matching with the user query. The feature library is a database which contains $N_D \times N$ elements in the element. Each element in the feature library belongs to the frequency of the $j$th keyword in the $i$th web pages. The number of keywords in the feature library is equal to the number of unique keywords in the input web pages.

$$F = \{f_{ij}; \ 0 \leq i < N; \ 0 \leq j < N_D \} \quad \text{...(6)}$$

Where, $f_{ij}$ is the frequency of $j$th keyword in the $i$th web pages, $N$ is the number of web pages in the input database and $N_D$ is the number of keywords.

![Block diagram of the proposed fuzzy integrated extended nearest neighbour classification algorithm for web page retrieval](image)

### 3.3 Retrieval of Web Pages using FENN Classifier

This section explains about the retrieval of web pages using FENN classifier which was newly developed by modifying the existing classifier given in [6]. Here, the input query from the user is obtained and it is given as input to the FENN classifier which finds the relevant documents of the input query by matching with the feature library. In this proposed FENN classifier, the neighbours of the input query and neighbours of neighbours of the input query is utilized to find the relevant document of the input query. The class of the input query $Q$ is computed using the following formula.

$$C = \text{Arg} \left\{ \max_{i=1}^{n} \left\{ \frac{C_i}{\sum_{i=1}^{n} C_i} \right\} \right\}$$

$$\text{...(7)}$$

The value of the $C_i$ is found out for every $i$th class using the following formulae. Here, the neighbour of the original input query and the neighbours of the neighbours of the original query sample is weighted with fuzzy score value. Every documents obtains the score value if it is presented within the neighbour or neighbour of neighbour. The score values are then weighted with alpha and beta to find the final score value of the every web page document.

$$C_i = \frac{\alpha \cdot G_i + \beta \cdot GG_i}{\alpha + \beta}$$

$$\text{...(8)}$$
Where, $\alpha$ and $\beta$ are the weighted constants, $G_l$ is the measure related to the $l$th class using neighbours of the input query. $GG_l$ is the measure related to the $l$th class using neighbours of neighbours of the input query.

$$G_l = \frac{1}{N \ast k} \sum_{r=1}^{k} E_r(q, w)$$  

... (9)

$$E_r(q, w) = \begin{cases} 1; & \text{if } q \in w_i \& \& N_r(Q, W) \in w_i \\ 0; & \text{otherwise} \end{cases}$$  

... (10)

Where, $N$ is the number of data samples in the input database, $k$ is the number of neighbours considered. $E_r(q, w)$ is computed by incrementing the belongings of query and neighbours.

$$GG_l = \frac{1}{N \ast k} \sum_{q \in w_i, r \in l} \sum_{r=1}^{k} E_{rr}(q, w)$$  

... (11)

$$E_{rr}(q, w) = \begin{cases} 1; & \text{if } q \notin w_i \& \& N_{rr}(Q, W) \in w_i \\ 0; & \text{otherwise} \end{cases}$$  

... (12)

Where, $N_l$ is the number of data samples belonging to the $l$th class. $E_{rr}(q, w)$ is computed by incrementing the belongings of query and neighbours of the neighbours. After finding the score value for every web page, the category having the maximum value is taken as the topic for the input query. Finally, the documents related to that category are retrieved from the database and is given to the users.

**Finding of neighbours:**

The neighbour for the input query is computed by matching the input query $Q$ with the feature library $F$ using the document similarity measure given in [8]. The reason behind the selection of this similarity measure is that it considered the frequency and similarity of the neighbour documents to provide the similarity values. The traditional techniques [1, 11] considered only the TF-IDF which is not suitable for measuring similarities between sentences if the common words are very less. But, this document similarity measure [8] considers the frequency of the query keyword within the web page and the similarity of the documents those who are having the query keyword. Also, these parameters are merged within the logarithmic function to confine the data range. The similarity of query $Q$ with web page $d_j$ is computed as,

$$d^p_Q = \log \left( 1 + \sum_{a=1}^{N_q} F^d_{a} \times IDF_{a} \times V_{dj} \right)$$  

... (13)

Where, $N_q$ is the number of query keywords. $F^d_{a}$ is the frequency of the query keyword $q_a$ within the web page $d_j$. $IDF_{a}$ is the inverse document frequency of the query keyword $q_a$. IDF is computed by taking the logarithmic ratio of the number of documents within the database and number of documents have the query keyword $q_a$.

$$IDF_{a} = \log \frac{N}{1 + \sum_{P \in W: w_g \in P}}$$  

... (14)

Where, $N$ is the number of documents within the input database $W$. The parameter of $V_{dj}$ is computed as follows:

$$V_{dj} = \frac{\sum_{j=1}^{N} D(d_k, d_j)}{N_r - 1}$$  

... (15)
Where, \( N_r \) is the number documents have the query keyword \( q_a \) and \( D(d_i, d_j) \) is the Euclidean distance between the neighbour documents. Figure 2 shows the algorithm procedure of the proposed FENN classifier.

![Algorithm procedure](image)

**4. RESULTS AND DISCUSSION**

This section shows the experimental results of the proposed FENN classifier and the quantitative evaluation of the proposed classifier with the existing methods.

**4.1 Experimental Set Up**

The proposed FENN classifier is implemented in java programming language with JDK 1.7.0. For experimental analysis, we have five benchmark queries from TREC 2002 web track data [10]. The bench mark queries are “intellectual property”, “foods for cancer patients”, “federal funding mental illness”, “criteria obtain us” and “home buying”. The web pages documents related to these queries are collected and it is given as input to the proposed web page retrieval scheme. Then, these five bench mark queries are given as input to the proposed system to retrieve the similar documents. The retrieved documents are then analyzed using precision, recall and f-measure. The definitions of these metrics are given as follows:

\[
\text{Precision} = \frac{N_{rel} \cap N_{ret}}{N_{ret}} \quad \ revenues.
TABLE 1. Retrieved web pages for two queries

<table>
<thead>
<tr>
<th>“home buying”</th>
<th>“federal funding mental illness”</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.forbes.com/sites/learnvest/2013/03/06/the-7-top-home-buying-mistakes-you-should-avoid/">http://www.forbes.com/sites/learnvest/2013/03/06/the-7-top-home-buying-mistakes-you-should-avoid/</a></td>
<td><a href="http://www.samhsa.gov/grants">http://www.samhsa.gov/grants</a></td>
</tr>
<tr>
<td><a href="http://www.dailyfinance.com/category/home-buying/">http://www.dailyfinance.com/category/home-buying/</a></td>
<td><a href="http://thinkprogress.org/health/2013/12/10/3044731/white-house-announces-100-million-mental-health/">http://thinkprogress.org/health/2013/12/10/3044731/white-house-announces-100-million-mental-health/</a></td>
</tr>
</tbody>
</table>

4.3 Performance evaluation

This section shows the performance evaluation of the proposed web page retrieval scheme using FENN classifier. In order to analyze the performance of the proposed web page retrieval scheme, we apply five queries for the proposed system and the retrieved results are validated using precision, recall and f-measure. The quantitative output of five queries is taken as average for every k value and it is plotted in figure 3, 4 and 5. Here, the performance is compared with other classifier like, ENN [6] and KNN [17]. From the figure 3, we understand that the proposed FENN obtained the maximum precision value of 94.28% when the k value is equal to two. The existing classifier like ENN and KNN obtained only 86.24% and 74.03%. From the figure 4, the maximum recall value of 93.45% is obtained for the proposed FENN classifier and the existing classifier obtained only 83.3% and 79.7%. From the figure 5, the f-measure of 93.8%, 84.7% and 76.7% is obtained by the FENN, ENN and KNN classifier. The results showed that the performance is decreased for higher values of k but the proposed FENN outperformed the existing methods in all the metrics.

5. CONCLUSION

We have presented a fuzzy included extended nearest neighbour classifier for web page retrieval. The proposed web page retrieval technique contains the construction of feature library and the classifying of the query input into a related category. Then, relevant category is utilized to perform the retrieval of the web page documents. The proposed FENN classifier considers neighbours and neighbours of neighbour with fuzzy weighted formulae to
compute the score value of every document for the user query. For the experimentation, we collect web page document relevant to five benchmark queries and the experimentation is performed using precision, recall and f-measure. The maximum F-measure of 93.86% is obtained for the proposed FENN classifier which reaches the higher value than the existing classifiers like, KNN and ENN. In future, efficient indexing structure can be developed to improve the retrieval performance.

REFERENCES

CLOUD COMPUTING TECHNOLOGY SETUPS TO SUPPORT: THE LEARNING MANAGEMENT SYSTEM (LMS) IN HIGHER EDUCATION INSTITUTIONS IN OMAN

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ABSTRACT

The cloud computing terminology is used widely nowadays. Some people may not understand its technical meaning but they keep repeating this word every time an organisation is involved. The most crucial issue is to understand the in-depth meaning of the terminology, especially, for the decision makers in any company. Any misunderstanding would lead to wrong decision-making which can cost the organisation much time and resources. The internet is one of the most vital infrastructures needed to deploy this kind of technology which has become an important part of our lives. The author will explain in details the various types of Cloud computing services, such as; SaaS (Software as a Service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service). This paper will discuss in detail the challenges and security issues that exist in the implementing of cloud computing service in most of the higher education initiations in Oman. In general, this paper will allow the organisations to choose where, when, and how they use cloud computing, and help the decision makers to play the right role in higher education institutions.

Keywords: Cloud-computing, Cloud-Security, Cloud-Challenges, Saas, PaaS, IaaS.

INTRODUCTION

Relevance of Cloud Computing in Higher Education

Just like business organisations are transforming by adopting cloud services, higher education institutions are also seeking a more effective way to implement their IT services without having to worry about the cost of either upgrades or maintenance. They want to adapt by being able to respond rapidly to new opportunities without taking long periods to implement a business-critical application (Katz & Educause, 2008). The higher institutions in Oman need to realise the full potential of their data systems in order to inform the strategic decisions of the future. Accordingly, there is no better way to achieve these unique needs than to adopt the cloud computing services.

Arias (2011) defines cloud computing as a computing paradigm where a large pool of systems are linked either in private or public networks, to offer dynamically scalable infrastructure for major purposes such as application, data and file storage. Similarly, cloud computing is a method of providing a set of shared computing resources including computing storage, networking, deployment platforms and business processes. It provides developers and IT departments with an opportunity to focus on what is critical in order to avoid undifferentiated work such as capacity planning and maintenance. It has become popular following different models and deployment strategies that have been developed to meet specific needs of various users. Therefore, every type of cloud service provides organisations with various levels of control, flexibility and management. The decision makers at higher education initiation in Oman stand to benefit from understanding the general aspects of cloud computing. The kind of cloud deployment that should be considered depends on Oman’s particular performance, security requirements and the specific business goals. Proper application of cloud computing in higher education institutions in Oman will help to change the way they operate and serve constituents. Moreover, it will offer the institutions the ability to serve the educators, administrators and students who possess technology devices.

Deployment Models

The type of cloud computing to deploy differs depending on the requirements. The Learning Management System (LMS) in higher education institutions in Oman can be managed by either of the following deployment models, with each having its specific features that support the needs of services offered and the users involved with the clouds.

• Public Cloud-This cloud infrastructure can be accessed by the public on a commercial basis through a cloud service provider (CSP). As such, the consumers are able to develop and deploy services with less financial
outplay. The financial factor is attractive for higher education institutions as other deployment options are associated with higher capital expenditure requirements.

- Private Cloud-This cloud infrastructure is maintained as well as operated for a specific organisation. These operations could be in-house or under the management of a third party still within the promises.

- Community Cloud-This cloud infrastructure is shared among various organisations that have common interests. If the higher education institutions were to adopt this type of cloud computing, they would be able to limit their capital expenditure costs in establishing the service as the costs are shared among the institutions. Most probably, satellite campuses have the best chance of using cloud computing infrastructure.

- Hybrid Cloud-The hybrid cloud infrastructure hosts a number of clouds of every type.

However, these clouds allow data and applications to be moved from one cloud to the other through their interfaces. It can combine the public and private clouds that support the need to retain some data within an organisation.

**SaaS (Software as a Service)**

SaaS is the most common model of cloud-computing model. It is a software that is deployed over the internet in the 21st century. With SaaS, the providers license an application to their consumers as a service that is offered through a subscription in a “pay-as-you-go” model. It can also be offered absolutely free when there is a chance to generate revenue from other streams such as user list sales. With SaaS, the education institutions will not need to think of whether the service is maintained or even how the infrastructure is managed. Rather, the focus will be on how the software will be used. Consumers can access the various applications under SaaS through applications such as Google Docs, Gmail or through other devices such as iPads, laptops and smart phones. Unlike other software used before, the SaaS model does not need a license or an upgrade for it to work. Other advantages of this model include its configurability and multitenant efficiency (Chao, 2012).

With respect to its common features, SaaS is managed from a central location and the software is delivered in a “one to many” model. It requires web access to commercial software, and the users are not required to handle any of the software upgrades and patches. One of its major characteristic is that it allows for the integration between the different pieces of software since it is boosted by Application Programming Interfaces (APIs). Cloud computing, specifically SaaS, has evolved over the past few years as a popular technological method in different institutions. Having said that, the higher education institutions that are considering the move to adopt Cloud computing should decide which of the applications to move to. Some of the recommended candidates to be moved to SaaS include the tax software used on monthly basis. Other applications that have a significant need for mobile access should be moved alongside those applications that interlink the organisation and the outside world such as the email newsletter software. However, there are specific situations that SaaS should not be used for software delivery such as applications that require fast processing of real time data or where regulation does not allow the data to be handled externally.

Oman could currently be approaching SaaS with caution. Many of the higher education institutions in Oman rely on applications that have been built on legacy mainframe, ERP platforms, or other home-grown apps. These applications are often difficult to maintain and upgrade which is a venture that takes a toll on their budgets especially now that education institutions are trying to cut down costs. SaaS takes care of these technical and budget issues that have for long nudged the higher education institutions to move closer to the inevitable transition. Some of the universities who have shared their experience of having implemented SaaS have cited significant gains in efficiency, scalability and availability. SaaS can be accommodated by the higher education institutions with ease as it can host various applications, ranging from the horizontally significant tools such as customer relationship management (CRM) to the more vertically useful tools for specific tasks such as classroom scheduling and medical bills management. Furthermore, SaaS has already been proven to be popular across many industries including in higher education since the early 1990s. It has played a significant role in U.S. universities and colleges where students have been able to share ideas, and education infrastructure, resulting in reduction of the various institutions’ overhead expenditures. Some of the SaaS providers that could be helpful to the higher education institutions in Oman include the Zoho, Salesforce.com and the Google Apps.

**PaaS (Platform as a Service)**

PaaS is defined as a computing platform that enables the consumers to create web applications easily thereby foregoing the complex challenges involved in purchasing and maintaining the software and infrastructure within it. With PaaS, the cloud service providers provide, operate and maintain the system software and the computing resources. The consumer’s role is to manage and run the application software provided by the CSP. Besides giving the customers the chance to access ready to use applications, PaaS gives them the opportunity to design, develop and test the applications directly on the cloud. However, the consumers have to gain access to the platforms by

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making a purchase to enable them to deploy their software and applications in the cloud computing platform. PaaS has an added advantage as it supports collaborative work between team members, making it suitable for multiple developers working on a common development project. PaaS is similar to IaaS in various ways, but it is unique due to its added value services. It is different from IaaS as it offers a collaborative platform for software development as well as a platform that allows software creation using proprietary data from an application. The major goal of the PaaS providers is to create an abstracted process that accommodates the deployment of high-quality applications that can be implemented either in public or private cloud models.

Despite its added advantages, the PaaS should not be used in cases where the applications require to be extremely portable with respect to where it is hosted. It is also not suitable where the proprietary approach would impact the development process or act as a hindrance to future moves to other providers.

IaaS (Infrastructure as a Service)

The IaaS contains the building blocks for cloud computing in IT. Just like the SaaS, IaaS is also developing at a fast rate to offer organisations an edge in terms of higher flexibility and management control over the IT resources. The IaaS delivers the Cloud Computing infrastructure such as servers, network and the operating systems as on-demand services. It is the most straightforward platform of the three models as it delivers computing resources in form of virtualised operating systems, hardware, software and storage services. It can be obtained either as a public or private infrastructure and/or both. The public cloud infrastructure is basically what consists of the shared resources that are provided on a self-service basis to the users over the internet. As for the private cloud infrastructure, virtualisation is practiced more in the form of the Cloud Computing features. According to Terplan (2011), some hosting providers are now offering a combination of traditional hosting along with public and private cloud networks. According to Sosinsky (2011), the consumer has the main responsibility of running and maintaining the operating system as well as the software applications on the virtual recourses.

IaaS acts as a practical solution for institutions and organisations that want access to resources through an on-demand basis. It is also used to augment the data centre services. Through this function, the providers are able to increase capacity on demand, replace the worn out hardware with cloud-based services and offer a continuous access to sophisticated services. Just like the major aim of any service model in business is to enable the specific organisation to access an on-going support as the business changes, IaaS allows the organisations to experiment with modern innovative software approaches with minimal budget alterations. Some of the core characteristics that describe IaaS is that it allows for multiple users per a single piece of hardware. The IaaS allows for dynamic scaling as the resources are distributed as a service. It makes sense in several situations that are also closely linked to its major benefits. Some of the most appropriate situations that deserve to be enhanced by the IaaS include where there are variations in demand of the infrastructure. It is also appropriate for companies that have insufficient capital to invest in hardware (Korzeniowski, 2011). Some of the higher education institutions were inspired by this feature to adopt cloud computing. Even more appropriate is if the organisation is growing rapidly in such a way that scaling the hardware would pose a huge challenge. IaaS is also suitable where an institution has an increasing pressure to limit its capital expenditure and try to compensate that with a more efficient operating expenditure (Mahmood, 2011). Evidently, the higher education institutions need to compete while being able to minimise their costs and capital expenditure. Therefore, the best option is cloud computing. It appears to be a good inspiration to adopt cloud computing for the higher education institutions, but it is not recommended where its limitations could be a hindrance. Such situations include situations where regulatory standards make data outsourcing more difficult. It is also not applicable where a higher level of performance is expected, or the current infrastructure still has the ability to meet the stipulated needs efficiently. One of the most famous public infrastructures in IaaS includes the Amazon’s Elastic Computing Cloud.

Important Features/Benefits that Cloud Computing could Offer to Higher Education Institutions situated in Oman

- Increased access to the limited IT expertise
- Decreasing capital expenditure and total costs of information technology in higher education institutions
- Enables the sourcing of either cycles or storage powered by renewable energy
- Scales IT services as well as resources
- Promotes additional IT standardisation
- Facilitates the direct match of IT costs, demand and funds
- Increases interoperability within previously disjoint technologies between institutions
- Enables universities to take advantage of the economies of scale they previously could not have achieved
• Free up more resources to support the core mission of the higher education institutions

**Challenges and Security Issues Faced when Implementing the Cloud Computing Service**

The challenges around implementing the cloud computing service within the higher education institutions in Oman relate to trust confidence and surety. Building an IT institution’s confidence in a system requires a combination of consistency in performance, service guarantees, transparency and plans for contingencies McDonald (2010). In most instances, cloud services may not have the track-assured record on which one can build the needed trust to shift the existing services without a proven compelling benefit. These service attributes, unfortunately, come with time and experience. On top of these challenges, most IT organisations within the higher education institutions are usually not highly skilled in assessing and managing risk as well as service performance in 3rd parties. Other challenges may include poor and/or non-existent service level agreements, market immaturity and management issues (Leymann, 2011).

Some cloud-computing requirements are similar across all sectors. However, The Learning Management System (LMS) in higher education institutions face particularly challenging circumstances in several areas. Specifically, higher institutions in Oman may face the challenge of finding the right balance between private and public cloud. They must determine the right balance after considering all the security and legal issues and then pursuing change management strategies so that all the stakeholders can comprehend why the institution favours one application over another. Secondly, data privacy implications tend to be the major concern for higher education IT organisations. In the past decade, security has assumed an added dimension of complexity due to the development of bring-your-own-device programs in many education institutions (Catlett, 2013). As such, the Oman education institutions could find themselves being overwhelmed by the huge number of devices all requiring some form of on-college protection.

According to Rittinghouse & Ransome (2010), the magnitude of the involved risks is amplified by the burden of public trust associated with institutions that conduct research on human objects. What’s more, the institutional culture acts as a real barrier to incorporating any of the above cloud computing models. Numerous research reports indicate that IT security and regulatory compliance also play a huge role in hindering the adoption of the cloud computing services being offered (May, 2011). IT experts in higher education institutions identify potential security breaches as the biggest barrier to adopting cloud computing models. There is a need to address the privacy issue that makes the above concerns real as they can be resolved through architecture. Unless the higher education institutions in Oman commit to study these issues, they may not be motivated to adopt the cloud computing services. Therefore, if the higher education institutions in Oman choose to adopt the cloud computing services, they could be faced with the following common risks associated with all cloud computing services in all industries:

• Lack of consumer isolation with the use of secure, scalable and multitenant services.
• Security which is not adequately focused during application.
• Failure to optimally exploit cost-saving initiatives such as disaster recovery during the cloud computing process.
• Insufficient virtualisation within the computing resources.

Whichever cloud computing strategy adopted by the Oman higher education institutions, it should always remain focused on firmly positioning education as the institutions’ priority. In higher education institutions, the major objective of cloud computing does not have to be geared towards reducing the headcount in IT. Instead, the major objective is to give technology an opportunity to support the higher education institutions by providing education to the students.

**CONCLUSION**

The innovative higher education institutions of Oman seek to understand how and where to deploy the cloud computing models efficiently and securely in a manner that decision makers can play the right role. Their choices promise to transform the role of technology in their institutions. The higher education institutions in Oman need to keep up with various competing demands, such as delivering web-based services to students at a rapidly accelerating pace without any proportionate increase in budget for upgrading software, hardware and improved personnel. They also need to compete against the rest of the global higher institutions, the majority of which are adamant in differentiating themselves in the market with respect to the services they offer to their learners. Therefore, to support the transition, the higher education institutions must develop the most suitable cloud-computing strategy that addresses the problems and needs unique to every institution. The strategy has to have a risk-assessment framework in order to lead the practitioners through a risk-analysis of both premises and cloud-based delivery alternatives. Adopting cloud-computing services in higher education institutions has to be conducted cautiously as the unique models have different usage of resources. Since it is a relatively new adoption
in Oman, the higher education institutions that wish to transition have to maintain contact with the organisations that establish the industry standards in order to ensure there is a uniform and smooth transition.

REFERENCES


IMPACT OF COVARIATES ON IMPROVEMENT IN CD4 CELL COUNT OF HIV/AIDS PATIENTS USING BAYESIAN POISSON REGRESSION MODEL

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ABSTRACT

HIV attacks CD4 cell counts, the most important component of the immune system. After infection, this count goes down gradually over years which ultimately leads to mortality of the patient. Antiretroviral therapy (ART) is a treatment for HIV/AIDS infection which improves the CD4 cell count and hence prolongs the survival of such patients. The improvement in CD4 cell count is dependent not only on several biological factors but also on behavioural factors. In this paper our primary objective is to estimate the effect of prognostic factors associated with change in CD4 cell counts of HIV/AIDS patients who are undergoing ART at Dr. Ram Manohar Lohia Hospital, New Delhi, India, using a Bayesian Poisson regression model. In this model, the prior distribution of parameters is assumed to be Multivariate Normal and hence posterior estimates are derived. The analysis is done using the MCMC pack in 'R' language. Variables like Gender, Alcohol, Drug user, initial WHO Staging, Body Mass Index, Marital Status, opportunistic infections, duration of ART, gain in weight and occupation are the significantly affecting the improvement in CD4 count.

Keywords: CD4 count; human immunodeficiency virus (HIV); Antiretroviral therapy (ART); Bayesian Poisson regression model.

1. INTRODUCTION

CD4 cells are a type of lymphocyte which are an important part of the immune system. They are considered "helper" cells because of their ability to trigger the body's response and lead the attack against infections. Although generally a higher CD4 count signifies healthier immune systems, the average count for a normal person is between 500 - 1200 cells per mm³ of blood.

HIV is a retrovirus that targets the CD4 cells and replicates itself. In HIV-infected individuals, the CD4 cell count provides a picture of immune system health. During infection, HIV attaches to these helper cells, emptying its genetic material within so that the host's genetic coding can be altered to produce other HIV virions. In this process, the host CD4 cell is killed, and its ability to trigger an immune defense is gradually depleted to such a point as to leave the body open to opportunistic infections. If left untreated, the immune system will, in all but rare cases, completely collapse. One of the quandaries of HIV infection is that the very cells meant to initiate an immune defense are the same ones targeted by HIV. (www.aids.about.com; www.avert.org)

Anti-RetroViral Therapy (ART), through a combination of antiretroviral drugs decreases the patient's total burden of HIV by limiting virus replication. This therapy maintains the function of immune system and prevents opportunistic infections to thrive on it. It suppresses the replication of the HIV virus in the body and has been very effective in reducing the number of HIV particles in the bloodstream (Del Rio, 2009). Researchers (Sabin et al, 2009; www.aidstruth.org) have proved that if the levels of HIV remain suppressed and the CD4 count remains high (above 200 cells/mm³), life can be significantly prolonged and improved.

Researchers have used CD4 cell counts as markers for assessing the damage done to the immune system of HIV infected persons. Akinbami et al., 2015 studied the association of maternal age, gestational age, and PCV at booking on CD4 cell count levels in pregnancy. Various researchers have noted that CD4 count of a normal individual depends on various factors ranging from gender, use of oral contraceptives, vaccination, fatigue, acute illnesses etc. Further, the CD4 count improvement in patients undergoing ART depends on biological parameters like higher pre-HAART virus load, and lower pre-HAART CD4 and CD8 cell counts and behavioral factors like gender, alcohol, drug abuse, adherence, system of care, ethnicity, etc. (Wasti et al., 2012; Smith et al., 2004; Chesney, 2000). Since the CD4 count improvement is an indicator for longer survival and better quality of life for the AIDS patients, it is important to assess the contribution of biological factors as well as various behavioral and socio-demographic factors.
on it. The improvement in CD4 count from baseline values is a discrete variable and hence Poisson Regression model (Cameron and Trivedi, 1998) is the most suitable form of analysis. Though many researchers (Lodwick et al., 2010; David dunn et al., 2008; Losina et al., 2007) have identified the impact of CD4 count on the mortality using Poisson regression models, very few authors had attempted to study the factors which are likely to influence the improvement in CD4 count of patients diagnosed of AIDS and undergoing ART. Mocroft et al. (2012) explored for differences in CD4 and viral load specific rates of fatal and non-fatal AIDS and non-AIDS events with respect to antiretrovirals using the Poisson regression model. Grover et al. 2015 have identified several prognostic factors using Poisson and generalized Poisson regression models. In this paper, we extend the results of Grover et al. 2015 and use Bayesian Poisson regression model for exploring the effect of various socio-demographic covariates on the improvement in the CD4 count of AIDS patients. The Bayesian approach allows inclusion of prior information on parameters into the estimation process and hence obtain a much more refined set of posterior estimates. Here, we have regressed the improvement in the CD4 count (which is calculated as the difference between the last known CD4 count from the baseline) on a set of predictors. Our objective here is to evaluate the effect of covariates like duration, stage of AIDS, gender, age, BMI etc. on the improvement of CD4 count in the patient. Since the data is in terms of counts therefore, Poisson model is favored over the usual linear regression models.

A retrospective data of AIDS patients undergoing ART was obtained from the ART centre of Ram Manohar Lohia Hospital, New Delhi, India. This is the largest ART centre in northern India and caters to a large number of patients coming across from various states in India. The data comprises of a cohort of AIDS patients who entered the ART centre at various points of time on or after 13th April, 2004 and were followed up till year 2010. These patients have been followed till the period 31st December 2010 and included are the cases who were lost either because of death due to AIDS or lost to follow up against medical advice. A socio-demographic profile that includes age, sex, region, marital status, profession, smoking, alcohol, drug user status, initial CD4 count, initial weight, height, date of admission, date of subsequent visits and corresponding CD4 counts, date of expiry/last known follow-up, WHO stage, opportunistic infections, mode of transmission etc. and biological record is maintained for every patient and all the vital parameters of interest are noted down at every follow-up.

2. MATERIAL AND METHODS

The Poisson regression model is a technique used to describe count data as a function of a set of predictor variables. Counts are all positive integers and for rare events the Poisson distribution (rather than the Normal) is more appropriate since the Poisson mean > 0. Poisson regression assumes the response variable \( Y \) has a Poisson distribution, and assumes the logarithm of its expected value can be modelled by a linear combination of unknown parameters. The typical Poisson regression model expresses the natural logarithm of the event or outcome of interest as a linear function of a set of predictors. (Frome, 1983).

Let \( Y_i \) denotes the improvement in CD4 cell counts for the \( i^{th} \) HIV/AIDS patient on Antiretroviral therapy. Since these data are in terms of counts, therefore, we assume that \( Y_i \) follows a Poisson distribution with mean \( \lambda_i \) (mean improvement in CD4 cell counts). Hence, the probability of observing any specific count \( Y_i \) is given by the following formula:

\[
P(Y_i = y_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \quad y_i = 0, 1, 2, ..., \lambda_i > 0
\]

We postulate that the mean value \( \lambda_i \) depends on a set of predictors \( x_1, x_2, ..., x_p \) such that

\[
\log(\lambda_i) = \beta_0 + \beta_1 x_1 + ... + \beta_p x_p
\]

or,

\[
\lambda_i = \exp(\beta_0 + \beta_1 x_1 + ... + \beta_p x_p) = e^{x^T \beta}
\]

**Bayesian Poisson regression**

We have,

\[
f(y_i / \lambda_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \quad y_i = 0, 1, 2, ...
\]
Let \( \lambda_i = \exp(\sum_{j=1}^{p} x_{ij} \beta_j) \), be the linear combination of covariates, where \( x_{ij} (i=1,2,...,n; j=1,2,...,p) \) are the covariates and \( \beta_j \)'s are the regression coefficients, then

\[
\exp[-\exp(\sum_{j=1}^{p} x_{ij} \beta_j) + \sum_{i} y_i \exp(\sum_{j=1}^{p} x_{ij} \beta_j)]
\]

\[
= \frac{\exp[-\exp(\sum_{j=1}^{p} x_{ij} \beta_j) + \sum_{i} y_i \exp(\sum_{j=1}^{p} x_{ij} \beta_j)]}{y_i!}
\]

\[
l_y(\beta) = \prod_{i=1}^{n} f(y_i) = \frac{\exp[-\sum_{i=1}^{n} (\exp(\sum_{j=1}^{p} x_{ij} \beta_j) + \sum_{j} \beta_j \sum_{j=1}^{p} x_{ij} \beta_j)]}{\prod_{i=1}^{n} y_i!}
\]

Let us assume the prior for \( \beta \) as

\[
\beta_j \sim N(a_j, b_j) \quad \text{for } j=1,2,...,p
\]

So the joint density of \( \beta \)'s can be written as:

\[
p(\beta_1, \beta_2, ..., \beta_p) = \prod_{j=1}^{p} \frac{1}{\sqrt{(2\pi b_j)}} \exp\left[-\frac{(\beta_j - a_j)^2}{2b_j}\right] \quad ; \quad -\infty < a_j < \infty, \ b_j > 0
\]

Therefore the posterior for \( \beta \)'s can be obtained as:

\[
P(\beta_j / Y_i) = L_y(\beta). p(\beta)
\]

\[
\frac{\exp[-\sum_{i=1}^{n} (\exp(\sum_{j=1}^{p} x_{ij} \beta_j) + \sum_{j} \beta_j \sum_{j=1}^{p} x_{ij} \beta_j)]}{\prod_{i=1}^{n} y_i!}
\]

\[
\frac{\prod_{i=1}^{n} y_i!}{\prod_{j=1}^{p} \sqrt{2\pi b_j}}
\]

\[
\frac{\exp[-\sum_{i=1}^{n} \exp(\sum_{j=1}^{p} x_{ij} \beta_j) - \frac{1}{2} \sum_{j} \frac{\beta_j^2}{b_j} + \sum_{j} \beta_j(\sum_{j=1}^{p} x_{ij} y_j + \frac{a_j}{b_j}) - \sum_{j=1}^{p} \frac{a_j^2}{2b_j}]}{\prod_{i=1}^{n} y_i!}
\]

\[
\frac{\prod_{i=1}^{n} y_i!}{\prod_{j=1}^{p} \sqrt{2\pi b_j}}
\]
Let \( d_j = \sum x_{ij} y_j + \frac{a_j}{b_j} \quad \text{for } j=1,2,\ldots, p \)

So, \( P(\beta_j) \propto \exp \left\{ -\sum_{i=1}^{n} \exp \left( \sum_{j=1}^{p} x_{ij} \beta_j \right) - \frac{1}{2} \sum_{j} \frac{\beta_j^2}{b_j} + \sum_{j} \beta_j d_j \right\} \)

which on simplification will yield a normal distribution with mean \( d_j \) and variance \( 2b_j \).

3. RESULTS

The descriptive summary and correlation of various socio-demographic factors is given in Grover et al., 2015. The Bayesian estimates of the Poisson regression model are given in Table 1. Using the Bayesian Poisson regression model, the significant variables that impact improvement in CD4 count are found to be gender, alcohol and drugs use, stage, body mass index, Mode of Transmission, land Status, marital status, opportunistic infections, Difference in weight, Occupation and Duration of time. For gender, the expected log improvement in CD4 count for females is 9.21% and males is 21.08% less than that of eunuchs. While Smoking does not significantly affect the improvement in CD4 count, alcohol consumption reduces the improvement in CD4 count by 4.17% and addiction to drugs reduces the improvement by 4.67%. With respect to stage-1 of AIDS patients, stage 3 has 4.07% and stage 4 has 10.57% less improvement in CD4 count. A unit increase in the BMI increases the improvement in CD4 count by 13.58%. Mode of transmission has no significant impact on the CD4 improvement. A person living in urban area is likely to have 8.54% more improvement as compared to the one having rural residence. An unmarried person will have 3.21% more improvement than a married one. As compared to an AIDS patient with Tuberculosis as an opportunistic infection, Diarrhea shows 5.15%, Other infection shows 5.27% and no opportunistic infection shows 11.82% higher improvement in CD4 count. Further, as the weight improves by 1kg, the CD4 count increases by 0.46%. As compared to unemployed, employed persons have 3.71% higher, housewives have 3.71% lower and unknown occupations have 4.14% lower improvement in CD4 count. Finally, as the duration of ART increases by 1 day, the improvement in CD4 count increases by 0.07%.

4. DISCUSSION

The idea of looking at the improvement in CD4 count as a discrete variable instills a whole new dimension in this research article. Also, the use of Bayesian approach provides a mechanism to incorporate the prior information into the estimation process so that the final set of estimates are better and more refined. Moreover, the process of identifying the variables which effect this improvement in CD4 count is an area which very few studies have evaluated. Even though, the idea of fitting the Bayesian Poisson regression model is to assess the factors affecting the improvement in CD4 count, the special focus is to identify the magnitude of influence that these significant factors have on the net improvement. Many of the previous research articles have used CD4 count in the analysis, but their studies assumed it to be a predictor of survivability (Lodwick et al., 2010; Pins et al., 1999), comparison of different regimes (Fontas et al., 2010)) or as a confounding factor (Reda et al., 2013).

Many of our results are similar to those reported by Grover et al., 2015 though the estimates of our model may be understood to be better due to inclusion of Bayesian perspective. The improvement in CD4 count is an indicator of higher survivability and hence comparisons with articles that identified impact of prognostic factors on the survival of AIDS patients can be done. As in previous studies, (Ghate et al., 2011; Moore et al. 2001) we too have observed that Males have a higher improvement in the CD4 count as compared to females and Eunuchs. Though smoking is found to have insignificant effect on improvement, Alcoholism and Drug addiction are found to have a negative impact. Age is found to be uncorrelated to the improvement in CD4 count and same is found in study by Smith et al (2004). A healthy individual reports a higher improvement and the same is seen in our study where BMI is positively associated with the improvement of CD4 cell count.

It however remains to be seen whether an overweight or obese patient would show the same level of improvement as a normal individual. Poor adherence and limited awareness about ART is probably one of the several reasons for the patients from rural areas to show significantly lower improvement as compared to urban locations. Increase in weight is seen to be positively correlated to the improvement in CD4 count and the findings are corroborated by Reda et al. 2013). It may be noted that BMI's positive correlation with improvement in CD4 count has no relation to the correlation of improvement in weight since BMI is a variable that is recorded at the initial follow-up only while increase in weight is the difference between last known weight and the initial weight. Hence increase in weight may be an indicator of improvement in the overall health status of an AIDS patient who usually grows weak due to recurring ailments as time progresses unless ART is administered.
An increased duration of therapy is found to be positively correlated with the improvement and a possible reason could be reduction in plasma viremia and percentage of infected peripheral blood cells (Al-Harthi, 2004) or adherence to treatment as well as social support. Unlike the study by Natu and Daga (2007) and similar to the studies by Somkiattiyos et al., 2012; Isidore et al., 2009, the WHO stage of the AIDS patients is seen to have significant association with the improvement. A patient in worse stage is seen to show greater improvement in CD4 count as compared to the better stage. Since the CD4 counts of worse stage patients are already very low, therefore ART raises it to a substantial level. However, for stages 1, 2, and 3 the CD4 counts may not be very low and hence ART simply sustains their counts at a nominal level. Tuberculosis is established as a major health challenge as compared to any other opportunistic infection as the improvement in CD4 count for such patients is substantially lower than that of other infections. Such an observation is highlighted by many research articles (Padmapriyadarsini et al., 2011; Swaminathan et al. 2010; Haileyesus et al., 2010). Similar to many studies (Somkiattiyos et al. 2012; Malini et al., 2009) our study also establishes occupation to be correlated with survival of AIDS patients. Regularly employed people show a higher improvement as compared to unemployed persons. However, housewives and unknown employment report significantly lower improvement as compared to unemployed AIDS patients.

There are two common difficulties viz., overdispersion and excess zeros in Poisson regression and are both caused by heterogeneity in the data. By heterogeneity in the data, we mean that there is more than one process that is generating the data, though it doesn’t appear to be the case on a simple overview of the data. Though our data didn't report even a single zero in the improvement in the CD4 count but, overdispersion was never really looked upon in the analysis. If overdispersion is indeed observed, it poses a setback for our study and hence Bayesian generalized Poisson regression models provides an alternative. However, for such models having a large number of prognostic

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<table>
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<th>Variables</th>
<th>Estimate</th>
<th>Std.error</th>
<th>p-value</th>
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factors, convergence of estimates is hard to achieve and hence pruning down the variables becomes inevitable. Also, important variables like adherence to antiretroviral therapy, pre-therapy viral loads or virologic suppression were not considered as a part of the model because of non-availability of data. While duration of therapy considered in our model acts as a pseudo for adherence to ART, the other variables which are proven markers of survivability of AIDS patients have still been left out.

5. ACKNOWLEDGEMENT

The authors are thankful to medical superintendent and director of ART center of Ram Manohar Lohia Hospital, Delhi for consulting the patients and providing the primary data for this research.

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[27] www.aidstruth.org

SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF SOME NEW FUSED CHROMENO PYRIMIDINE ANALOGS

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ABSTRACT

The aim of the study is to design and synthesize the new bioactive heterocyclic compounds. Pyrimidine are an important class of heterocyclic compounds that are known to possess important pharmacological and antimicrobial properties. Chromeno pyrimidines are compounds having both pyrimidines and 2H-chromenes in their structures. Hence, the synthesis of novel chromeno pyrimidine containing chloro, fluoro, trifluromethyl groups have been carried out, by multi-step organic synthesis, in order to study their interesting antimicrobial properties. The synthesized compounds were characterized by 1H NMR, 13C NMR, 19F NMR, FT-IR, GC-MS and elemental analysis. They were screened for their antibacterial activities against Gram-positive (Staphylococcus aureus, Bacillus subtilis), Gram negative (Escherichia coli, Pseudomonas aeruginosa) bacteria and anti-fungal activities against Aspergillus niger and Candida albicans by cup plate method. The fluoro and trifluoro methyl derivatives showed a highest anti-microbial activity compared to the others.

1. INTRODUCTION

Growing consumption of various antibiotics for the treatment of microbial infections leads to the appearance of multi-drug resistant (MDR) microbial pathogens. Although there are several drugs available for the treatment of microbial infections, they are still not completely effective and still possess a certain degree of toxicity and quickly develop resistance due to large scale use. Therefore, there is an immediate need for new antibacterial and antifungal chemical structures alternatives to the existing ones [1]. Heterocycles containing the chromene moiety and pyrimidine show interesting features that make them an attractive target for MDR.

Chromenes, an important chromophore in modern drug discovery that represent an important class of naturally occurring compounds [2], [3]. They have gained wide industrial recognition due to their contribution towards several biologically active drug candidates possessing significant pharmacological activities with anti-bacterial [4], antifungal [5], anti-HIV [6] and anti-cancer [7] properties. Studies conducted previously had reported that substituted chromenes with the receptors increase the ability of molecule in preventing the disorder and possess different pharmacological activities with lower toxicity [8], [9].

Pyrimidine, on the other hand structurally diverse synthetic derivaties [10], [11] Some of the pyrimidine derivatives are reported to exhibit antimicrobial property against a variety of bacteria, fungi and displayed their potential as a polyfunctional backbone for new antimicrobial agents [12]–[21]. In general, studies showed some significantly biological properties when any combination of two different heterocyclic moieties in a single framework [21], [22]. For instance, pentafluorophenylammonium triflate (FPAT) showed potential against all the fungal and bacterial strains[23]. Similarly, 1,2,4-triazolo [3,4-b][1,3,4]thiadiazole-6-yl] selenophenol [2,3-d] pyrimidines compounds have showed promising antioxidant, antifungal and antibacterial activity [24]. Although these compounds have been widely studied individually due to their inherent pharmacological properties but only recently, fused structures incorporating both pyrimidine and chromenes scaffolds were synthesized. Several studies have been conducted previously for antimicrobial activities, and the majority had focused on the synthesis of Chromeno-pyranopyrimidines, chromeno-pyrimidine-amine Pyrimidine-thienopyridine derivatives [25]–[27]. The synthesized compounds have been evaluated for their antimicrobial activities against gram-negative bacteria, gram-positive and negative bacteria, and antifungal as respectively. Synthesis of chromeno pyrimidines has been of considerable recent interest as they exhibit biological activity in comparison to other heterocycles. Prompted by these observation, we propose a new novel heterocyclic compound, a new type of hybrid that clubbed both of chromene and pyrimidine, i.e., 6-Chloro-2-hydroxy-N-(pyrimidin-4-yl)-2-(trifluoromethyl) chroman-3-carboxamide derivatives with a view to produce promising biologically active compounds. Further we also describe an efficient and practical method for the preparation along with antifungal and antimicrobial potential of the newly derived chromeno pyrimidines. The novel compounds passed Lipinski rule of 5[33].

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2. EXPERIMENTAL

All the chemicals were of LR grade and obtained from Sigma Aldrich. Melting points were determined in open capillary tubes sealed at both end using an electrical melting point apparatus. IR spectra were obtained on a Shimadzu-8400 FTIR spectrophotometer and the samples were made into pellets using KBr powder. 1H NMR spectra were recorded on Bruker spectrometer (400 MHz) using DMSO-d6 / CDCl3 as a solvent. 13C NMR spectra were recorded on Bruker spectrometer (100 MHz) in DMSO-d6 / CDCl3. 19F NMR spectra were recorded on 376 MHz in CDCl3 solvent. All the reactions were monitored by thin layer chromatography (TLC) on pre coated silica gel paper having mesh size 60 - 254. Spots were visualized using UV light, I2 vapors, or KMnO4.

2.1 General Method for the Synthesis of Substituted 2H-Chromene Ester Derivatives (3a-c)

A mixture of aromatic aldehyde (1a-c) (1.00 g, 6.4 mmol), ethyl-4,4,4-trifluoro acetoacetate (2) (1.424 mL, 6.4 mmol), piperidine (63 µL,0.64 mmol) in ethanol (20 mL) was refluxed in an oil bath at 93 °C for 4 hours with stirring under inert nitrogen atmosphere. The progress of the reaction was monitored by TLC using 20 % ethyl acetate- hexane solvent system. The yellow solution turned dark brown. The compound was purified by column chromatography using hexane.

(3a): Crystalline white solid; M.P(117-119°C); IR (υmax cm⁻¹): 3620, 3314, 1700, 1636 1565, 1460; 1H-NMR (CDCl3, 500 MHz) δ 7.74 (dd, J = 2.0, 1.0 Hz, 1H), 7.56 – 7.25 (m, 2H), 7.00 (d, J = 7.5 Hz, 1H), 4.72 – 3.93 (m, 2H), 2.20 (s, 1H), 1.27 (t, J = 5.9 Hz, 3H).

13C NMR (CDCl3, 75 MHz) (δ): 166.4, 151.0, 137.9, 133.4, 128.6, 127.6, 118.7, 117.4;

19F NMR (δ): -87.02; HRMS: calc. For m/z (C13H10ClF3O4 + Na)⁺: 354.0118; found: 354.0135

(3b): Off-yellow solid; M.P(162-165°C); IR (υmax cm⁻¹): 3601, 3000, 2960, 1735, 1620, 1429; 1H-NMR (400 MHz, Chloroform-d) δ 7.84 (dp, J = 7.7, 0.8 Hz, 1H), 7.81 – 7.44 (m, 2H), 7.08 (d, J = 7.5 Hz, 1H), 4.67 (dq, J = 12.4, 5.9 Hz, 1H), 4.00 (dq, J = 12.4, 5.9 Hz, 1H), 2.32 (s, 1H), 1.27 (t, J = 5.9 Hz, 3H). 13C NMR (125 MHz, CDCl3) δ 164.99, 155.76, 131.10, 129.98, 128.94, 125.81, 118.64, 116.60, 114.80. 19F NMR δ: -87.02, -62.80; Elemental analysis for C14H10F6O4 356.03 g/ mole is C, 44.85; H, 2.05; Cl, 21.03; F, 19.35; O, 21.7 % HRMS: calcd. For m/z (C14H10F6O4 + Na)⁺:356.22; found: 356.05

(3c): Off-white solid, M.P(154-156°C); IR (υmax cm⁻¹): 3640, 3324, 1790, 1676 1565, 1461; 1H-NMR (400 MHz, Chloroform-d) δ 7.57 – 7.25 (m, 2H), 7.29 – 6.88 (m, 2H), 4.55 (dq, J = 12.4, 5.9 Hz, 1H), 4.11 (dq, J = 12.4, 5.9 Hz, 1H), 2.31 (s, 1H), 1.27 (t, J = 5.9 Hz, 3H); 13C NMR (125 MHz, CDCl3 NMR Solvents) δ 165.48, 164.07, 155.03, 152.59, 131.16, 130.08, 126.18, 118.36, 117.30, 115.74, 113.48. 19F NMR δ: -87.02-134.13 Elemental analyses for C15H11F6O4 are C, 50.71; H, 3.20; Cl, 8.02; F, 24.45; O, 20.84 %; HRMS: calcd. For m/z (C15H11F6O4 + Na)⁺:306.27; found: 306.03

2.2 General Method for the Synthesis of Substituted 2H-Chromene-3-Carboxylic Acid Derivatives (4a-C)

The ester compound (3a-c) (3.22 g, 0.01 mmol) was dissolved in 20 ml of methanol and the NaOH (2 g) dissolved in 30 mL water was added slowly to the ester solution. The reaction mixture was refluxed for 4 hours, monitored by TLC (solvent: 25 % ethyl acetate- hexane). After cooling, the concentrated HCl (5mL) was added to give a white precipitate that was filtered and recrystallized from cold water.

(4a): White solid, M.P(154-158°C); IR (υmax cm⁻¹): 3629, 3425, 3122, 3111, 1875,1720, 1625, 1592; 1H-NMR (500 MHz, Chloroform-d) (δ): 9.45 (s, 1H), 7.79 (dd, J = 2.0, 1.0 Hz, 1H), 7.72 (d, J = 0.9 Hz, 1H), 7.45 (dq, J = 7.5, 2.0 Hz, 1H), 7.02 (d, J = 7.4 Hz, 1H), 2.44 (s, 1H). 13C NMR (125 MHz, CDCl3) (δ): 168.80, 136.17, 130.18, 128.81, 127.29, 124.50, 122.36, 120.21, 118.07, 117.27, 99.03, 98.39. 19F NMR δ: -87.02. Elemental analysis for C11H7ClF6O4 294.61 g/ mole is C, 44.85; H, 2.05; Cl, 21.03; F, 19.35; O, 21.7 % HRMS: calcd. For m/z (C11H7ClF6O4 + Na)⁺: 317.611; found: 317.572.

(4b): White solid, M.P (166-168°C); IR (υmax cm⁻¹): 3631, 3394, 3196, 3022, 2028, 1874, 1725, 1625, 1562, 1492; 1H-NMR (400 MHz, Chloroform-d) δ 7.93 – 7.50 (m, 2H), 7.37 (d, J = 1.0 Hz, 1H), 7.08 (d, J = 7.5 Hz, 1H), 2.15 (s, 1H). 13C NMR (125 MHz) δ 165.74, 155.76, 131.99, 129.84, 125.81, 118.64, 115.70. 19F NMR δ: -87.02, -62.80; Elemental analysis for C12H8ClF6O4 is C, 47.71; H, 2.20; F, 32.45; O, 17.84 %; HRMS calcd for m/z C12H8ClF6O4 + Na+: 328.17; found: 328.02

(4c): White solid; M.P(161-162°C); IR (υmax cm⁻¹): 3621, 3314, 3196, 3012, 2028, 1864, 1715, 1625, 1552, 1492; 1H-NMR (107 MHz, Chloroform-d) δ 7.53 – 7.23 (m, 2H), 7.23 – 6.94 (m, 2H), 2.15 (s, 1H); 13C NMR (125 MHz,
Amatur Roquia & Tilak Ram

CDCl3) δ 165.74, 164.45, 155.03, 152.59, 132.53, 131.44, 126.18, 118.36, 117.30, 115.74, 113.48, 112.73; 19F
NMR δ: -87.02,-134.13; Elemental analysis for C11H6F4O4 is C, 47.71; H, 2.20; Cl, 8.02; F, 27.45; N; O, 23.84 %;
HRMS: calcd. For m/z (C11H6F4O4 + Na) +:278.27; found: 278.03.
2.3 General Method for the Synthesis of Chromeno Pyrimidines
The compound (4a-c) (carboxylic acid 0.01mmol) and substituted aromatic amines(5) (amine 0.01mmol) were
dissolved in 1mL of dry dichloromethane. N,N,N′,N′-tetramethyluranium O-(benzotriazol-1-yl) tetrafluoroborate
(TBTU)(0.02mmol) and triethylamine(0.03mmol) was added. The reaction mixture was refuxed for 18-20 hours,
and
monitored by TLC using ethyl acetate and hexane solvent. The product was purified by column
chromatography using hexane as the solvent.
(6a1):Light yellow solid ; M.P(167-1690c); IR (vmaxcm-1) : 3819 ,3615, 3340, 3310, 2899, 2105, 1971, 1912, 1815,
1616, 1547, 1H-NMR (107 MHz, Chloroform-d) δ 9.37 (s, 1H), 8.83 (dd, J = 1.5, 0.4 Hz, 1H), 8.58 (dd, J = 5.0,
0.4 Hz, 1H), 7.53 (dd, J = 2.0, 1.0 Hz, 1H), 7.37 – 7.04 (m, 2H), 6.91 – 6.54 (m, 2H), 2.49 (s, 1H). 13C NMR
(125MHZ, CDCl3) δ 172.54, 171.41(CO), 158. 76, 156.60, 150.91, 128.99, 127.62, 126.80, 125.80, 118.61,
115.39, 109.47, 100.55, 19F NMR δ: -87.02. Elemental analysis for C15H11ClF3N3O3 is C, 48.21; H, 2.97; Cl, 9.49;
F, 15.25; O, 12.84; N, 11.24 % HRMS: calcd. For m/z (C15H11ClF3N3O3 + Na) +:373.01; found: 373.04
(6a2):Yellow solid ; M.P (176-1780c); IR (vmaxcm-1): 3634, 3214, 3005, 2654, 2052, 1992, 1699, 1369; 1H-NMR
(500 MHz, Chloroform-d) δ 9.47 (s, 1H), 8.28 (d, J = 5.0 Hz, 1H), 7.53 (dd, J = 2.0, 1.0 Hz, 1H), 7.39 – 7.05 (m,
2H), 7.02 – 6.65 (m, 2H), 2.46 (s, 1H). 13C NMR (125 MHz) δ 172.54, 171.41, 168.44, 159.02, 155.53, 154.05,
150.91, 128.99 127.62, 126.80, 125.80, m 118.61, 115.39, 104.32, 19F NMR δ: -87.02, -95.5. Elemental for
C15H8ClF4N3O3 C, 48.99; H, 2.57; Cl, 9.05; F, 19.45; O, 12.84; N, 10.24 %; HRMS: calcd. For m/z
(C15H8ClF4N3O3 + Na) +:389.71; found: 389.03
(6a3):Off-white solid ; M.P(177-1790c); IR (vmaxcm-1): 3898, 3678, 3399,3577, 2627, 1995, 1778, 1735, 1588,
1404; 1H-NMR (400 MHz, Chloroform-d) δ 9.44 (s, 1H), 8.52 (d, J = 5.0 Hz, 1H), 7.80 (d, J = 5.0 Hz, 1H), 7.53
(dd, J = 2.0, 1.0 Hz, 1H), 7.40 – 7.05 (m, 2H), 6.79 (d, J = 7.5 Hz, 1H), 2.46 (s, 1H); 13C NMR (125 MHz, CDCl3)
δ 172.54, 171.41, 160.89, 159.70, 155.00, 153.84, 150.91, 128.99 – 127.62, 126.80, 125.80, 124.76, 118.61,
115.07, 109.81, 19F NMR δ: -87.02; Elemental analysis for C16H8ClF6N3O3 is C, 43.71; H, 1.20; Cl, 8.06; F, 25.45;
O, 10.84; N, 9.01 %; HRMS: calcd. For m/z (C16H8ClF6N3O3 + Na) +:439.71; found: 439.03
(6b1):yellow solid; M.P(192-1940c); IR (vmaxcm-1): 3899, 3715, 3350, 3312, 2899, 2105, 1961, 1942, 1875, 1646,
1597; 1H-NMR (400 MHz, Chloroform-d) δ 9.12 – 8.76 (m, 2H), 8.38 (dd, J = 5.0, 1.5 Hz, 1H), 7.71 (s, 1H), 7.34
– 6.86 (m, 2H), 6.69 (d, J = 7.5 Hz, 1H), 4.08 – 3.72 (m, 1H), 3.53 (ddd, J = 17.1, 9.0, 1.0 Hz, 1H), 3.05 (ddd, J =
17.1, 9.2, 1.0 Hz, 1H), 2.32 (s, 1H). 13C NMR (125 MHz, CDCl3) δ 164.59, 158.35, 157.25, 155.76, 131.99,
129.84, 125.81, 118.64; 19F NMR δ: -87.02, -62.80; Elemental analysis for C16H11F6N3O3 is C, 47.71; H, 2.20; F,
27.45; N, 10.33; O, 11.84 % HRMS: calcd. For m/z (C16H11F6N3O3 + Na) +:402.27; found: 407.07
(6b2):Yellow solid ; M.P (197-1980c); IR (vmaxcm-1): 3632, 3225, 3059, 2647, 2546, 2512, 1978, 1831, 1748; 1HNMR (500 MHz, Chloroform-d) δ 8.55 (d, J = 5.0 Hz, 1H), 7.81 – 7.58 (m, 2H), 7.16 (dtd, J = 7.5, 1.7, 0.8 Hz,
1H), 6.97 – 6.55 (m, 2H), 3.55 (t, J = 3.7 Hz, 1H), 3.28 (ddd, J = 16.9, 3.6, 1.0 Hz, 1H), 2.97 (ddd, J = 16.8, 3.7,
1.0 Hz, 1H), 2.07 (s, 1H); 13C NMR (125MHz, ) δ 168.35, 164.59 , 158.93, 156.35 , 154.73 , 154.02 , 131.99 ,
129.84 , 125.81 , 118.64, 116.60 , 114.80 , 105.53; 19F NMR δ: -95.45, -87.02, -62.80. Elemental analysis for
C16H10F7N3O3 is C, 45.71; H, 2.20; F, 37.45; N, 9.33; O, 11.84 %; HRMS: calcd. For m/z (C16H11F6N3O3 + Na)
+
:425.27; found: 425.07
(6b3):Yellow solid; M.P (197-1990c); IR (vmaxcm-1): 3600, 3310, 3100, 2610, 2122, 1926, 1788, 1734, 1656, 1554;
1
H-NMR (400 MHz, Chloroform-d) δ 8.53 (d, J = 5.0 Hz, 1H), 7.71 (s, 1H), 7.52 – 7.13 (m, 2H), 7.31 – 6.68 (m,
2H), 3.67 (t, J = 4.3 Hz, 1H), 3.32 (ddd, J = 17.8, 4.2, 1.0 Hz, 1H), 3.07 (ddd, J = 17.8, 4.4, 1.0 Hz, 1H), 2.00 (s,
1H). 13C NMR (125 MHz, CDCl3) δ 172.54, 171.41, 160.12, 158.83, 156.17, 152.96, 129.02, 126.67, 124.85,
118.62, 115.26, 108.59, 107.23; 19F NMR δ: -87.02, -62.80; Elemental analysis for C16H10ClF6N3O3 is C, 43.71;
H, 2.20; Cl, 8.02; F, 25.45; N, 10.33;
(6c1): Off orange solid; M.P (171-1730c); IR (vmaxcm-1): 3501, 3340. 3127, 3100, 2904, 2764, 2648, 2179, 1982,
1953, 1788, 1751; 1H-NMR (500 MHz, Chloroform-d) δ 9.37 (s, 1H), 8.83 (dd, J = 1.5, 0.4 Hz, 1H), 8.58 (dd, J =
5.0, 0.4 Hz, 1H), 7.38 – 7.04 (m, 2H), 6.95 – 6.54 (m, 3H), 2.50 (s, 1H);13C NMR (125 MHz, CDCl3) δ 165.07 –
164.07, 158.35, 157.25, 155.03, 152.59, 131.99, 126.18, 118.36, 117.30, 115.74, 113.48, 112.73, 109.48, 106.92,
105.16, 104.53, 95.43; Elemental analysis for C15H9F4N3O3 is C, 50.71; H, 2.20; F, 21.45; N, 11.33; O, 13.84 %.
HRMS: calcd. For m/z (C15H9F4N3O3 + Na)+: 355.27; found: 355.03 19F NMR δ: -87.02 ,-134.13.
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(6c): Yellow solid; M.P(175-177 °C); IR (vmax cm⁻¹): 3546, 3177, 3165, 3085, 2782, 2489, 2323; ¹H-NMR (400 MHz, Chloroform-d) δ (ppm): 8.92 – 8.56 (m, 2H), 7.71 (s, 1H), 6.80 – 6.33 (m, 3H), 3.90 (t, J = 9.1 Hz, 1H), 3.54 (ddd, J = 17.1, 8.9, 0.9 Hz, 1H), 3.07 (ddd, J = 17.1, 9.2, 1.0 Hz, 1H), 2.34 (s, 1H); ¹³C NMR (125 MHz, CDCl₃) δ 172.54, 171.41, 164.11, 160.89, 159.70, 154.45, 148.18, 128.62, 125.27.

2.4 General Procedure for Testing the Anti-Bacterial Property

The antibacterial activities of newly synthesized chromeno pyrimidines along with compounds (3a-c) and (4a-c) were tested against four bacterial strains such as Staphylococcus aureus, Pseudomonas aeruginosa, which are Gram-positive bacteria; and Escherichia Coli, Bacillus subtilis that are Gram-negative bacteria by cup-plate method [29]. Second, the Sterilized Nutrient agar medium was sterilized and distributed (100 ml each) into two 250 mL conical flasks. Finally, they were allowed to cool room temperature. The bacterial sub-cultures were grown for 18-24 h, which were added to each of these media and were shaken systematically. Thus, the bacterial cultures were uniformly distributed in the various media. Equal quantities of the agar medium were added into sterilized Petri dishes and it was ensured that each 45-50 ml of the medium was present in each Petri dish. The medium was allowed to solidify and a sterile cork borer, consuming a diameter of 6 mm, was used to punch the agar media to prepare the cups.

The compounds used under study was dissolved in DMF to obtain solutions having the required concentrations (50, 100 μg/ mL). 1 mL of each solution was filled into the cups. Then, the Petri dishes were placed in an inverted position and incubated for 24-48 h at 37 °C in an incubator. Growth inhibition zones developed surrounding each cup after which, their diameters were measured (mm) and compared to standard drugs, Streptomycin and Procaine penicillin.

2.5 General Procedure for Testing the Anti-Fungal Property

The antifungal activities of newly synthesized compounds along with compounds (3a-c) and (4a-c) were tested against two fungi Aspergillus niger and Candida albicans at concentrations of 50 μg/mL and 100 μg/mL by cup-plate method [29]. Griseofulvin was chosen as the standard. The potato dextrose agar medium was sterilized and then incubated for 72 h. Fungi were subcultured and added uniformly by stirring the media. Petri dishes were cleaned and labeled into which the media were poured. They were then allowed to solidify. The plates were then bored to make cups, four of them in each plate. 0.1 mL of the two test dilutions were added to two cups and the two corresponding test dilutions of the standard to the other two cups. After leaving the plates for 2-3 h to allow diffusion to take place, they were incubated at 37 °C for 24 h. The diameters of the zones of growth inhibition were measured (mm) and compared to the standard.

3. RESULTS AND DISCUSSION

As shown in scheme 1, chromene esters (3a-c) possessing the hydroxyl and trifluoro groups were initially synthesized as intermediates utilizing piperidine catalysed multi component reaction of aromatic aldehydes(1a-c) and ethyl-4,4,4-trifluoro acetocetate in refluxing ethanol. Various aldehydes as shown in table 3 were utilized for the synthesis of these compounds. The formation of the products was confirmed by comparison of the analytical data in the case of (3a-c) with the reported data. The IR spectra of (3a-c) showed absorption bands at 3620, 3601, 3640 cm⁻¹ for free OH, 1700, 1735, 1790 cm⁻¹ for CO in esters. The ¹H NMR spectra gave triplet at δ 1.27 ppm and multiplet at δ 4.72 – 3.93 ppm shows the presence of 3H and 2H next to the ester group. The ¹³C NMR spectra of 3a showed at signal δ -87.02 ppm showed the presence one type of fluorine atoms while ¹⁹F spectra of 4a showed two signals at δ -87.02, -62.80 ppm showing the presence of fluorine atoms in two different environments. After the initial reaction which required 4h of reflux, the esters were subjected to hydrolysis using NaOH to obtain corresponding chromene carboxylic acids as intermediates(4a-c). A sequential addition of substituted pyrimidines, TBTA and triethylamine to the same reaction mixture containing compounds(4a-c) afforded the final products amides(6a₁₋₃, 6b₁₋₃, 6c₁₋₂). Completion of all the reactions was monitored by a simple TLC analysis. The IR spectra of chremeno pyrimidines (6a₁₋₃, 6b₁₋₃, 6c₁₋₂) showed absorption bands corresponding to N-H stretching in the range of 3350-3210 cm⁻¹. The ¹³C-NMR spectra of all the synthesized compounds showed the quartets of CF₃ and C-2 atom with their corresponding coupling constants ¹JC,F = 289–291 Hz and ²JC,F = 33.6–36.4 Hz, which appeared at 122.0–123.0 ppm and 95.2–96.6 ppm respectively.
Scheme 1: Route for the synthesis of chromeno pyrimidines

3.1 Antibacterial Activity

Table 1: Screening of the compounds for antibacterial property

<table>
<thead>
<tr>
<th>Compound</th>
<th>Gram-positive bacteria (µg/mL)</th>
<th>Gram-negative bacteria (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S.aureus</td>
<td>B.subtils</td>
</tr>
<tr>
<td>3a</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>4a</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>6a1</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>6a2</td>
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<td>16</td>
</tr>
<tr>
<td>6a3</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>3b</td>
<td>13</td>
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<tr>
<td>4b</td>
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<td>3c</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4c</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>6c1</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>6c2</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Streptomycin</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Procaine penicillin</td>
<td>22</td>
<td>27</td>
</tr>
</tbody>
</table>

The results of the anti-bacterial screening are presented in table 1. From the table, it can be seen that compounds (3a-c) and (4a-c) exhibited some antibacterial property. However, activities of the chromeno pyrimidines (6a1-2, 6b1-3, 6c1-2) were significantly higher as compared to compounds (3a-c) and (4a-c). This shows that the introduction of a pyrimidine moiety increased the anti-bacterial properties. The substituents on the aromatic ring...
and pyrimidine rings had an effect on the anti-bacterial properties. Compounds (6a, 6a₂, 6c₁) showed moderate anti-bacterial activities against all the four strains. The fluoro substituents showed activities better than the other substituents. This was consistent with the results of a previous study [29]. The 2, 4- difluoro substituent (6a₃, 6b₁, 6b₂, 6b₃, 6c₂) showed the best activity against all the bacterial strains. The activities of (6a₃, 6b₁, 6b₂, 6b₃, 6c₂) were comparable to standard antibiotics, such as streptomycin and procaine penicillin.

3.2 Antifungal activity

<table>
<thead>
<tr>
<th>Compound</th>
<th>A. Nigер (µg/mL)</th>
<th>C. Albicans (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 µg/mL</td>
<td>100 µg/mL</td>
</tr>
<tr>
<td>3a</td>
<td>7</td>
<td>11</td>
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<tr>
<td>4a</td>
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<tr>
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</tr>
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<tr>
<td>4b</td>
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</tr>
<tr>
<td>6b₃</td>
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<td>23</td>
</tr>
<tr>
<td>6c₂</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>Griseofulvin</td>
<td>20</td>
<td>35</td>
</tr>
</tbody>
</table>

The results of the anti-fungal screening are presented in table 2. The results of the antifungal screening were similar to the antibacterial screening. All the compounds showed anti-fungal activity. The antifungal activities of the chromeno pyrimidines (6a₁-₂, 6b₁-₃, 6c₁-₂) were considerably higher than that of compounds (3a-c) and (4a-c), which again indicated that the incorporation of the pyrimidine ring to chromene moiety had a positive effect on the anti-fungal properties. The effects of the different substituents on the anti-fungal properties were also studied. The chromeno pyrimidines that contained fluoro substituents showed very good anti-fungal properties. Amongst all the chromeno pyrimidines, the difluoro compounds (6b₂, 6c₂) showed the best anti-fungal activity against both the fungal strains.

3.3 Lipinski Rule of 5

The Lipinski rule uses following criteria to determine if a substance is drug like:

- Five or fewer H-bond donors
- Ten or fewer H-bond acceptors
- Molecular weight under 500 daltons
- LogP lower than 5.

With reference to table 4, all the synthesized compounds of chromeno pyrimidine pass the Lipinski rule of 5 which is good result for indicating drug like properties.
4. CONCLUSION

Novel chromeno pyrimidines were synthesized using a simple multi-step strategy in good yields. The synthesized compounds were well characterized and tested for their antibacterial and antifungal activities. The fluoro-substituted compounds showed the greatest activities. These results give an insight into the structure-property relationships, which are tremendously important for the design of further new antimicrobial compounds.

Table 3: Synthesis of Novel Chromeno pyrimidines

<table>
<thead>
<tr>
<th>Entry Number</th>
<th>Aromatic Aldehyde</th>
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REFERENCES


SHARED SECRET KEY SPLITTING WITH CONFIDENTIALITY AND AUTHENTICATION

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ABSTRACT

Hadoop was designed barring any security model. It’s didn’t authenticate user or services. The initial defiance of enabling security in Hadoop is to deal with access permission of Data block goes through the Name Node and restrain impersonation where a user can mistreat and simulate another user to have access on other’s data in the HDFS cluster. There is no enforcement of access control by Data Node on access to its data blocks. Name Node issue the secret key to all Data Nodes. Various security vulnerabilities can occur in block access token, which is used for the permission control of data block in Hadoop. In this paper, a shared secret key splitting with Confidentiality and authentication scheme is proposed to overcome such security vulnerabilities.

Keyword: Hadoop ; block access token ; authentication; confidentiality , secret key

1. INTRODUCTION

Initially Hadoop was created without security personality a main priority, no security show, no validation of clients and administrations and no information protection, so anyone could submit self-assertive code to be executed [1].

At the point when client approach Name Node for Data storage, Name Node secure Data Node for data stockpiling and afterward a block access token is made for user authentication. In numerous environments, it is more essential that communication be authenticated rather than encrypted. That is, both sides ought to be persuaded of one another identity. We have to set up and verify identity before permitting access to resources. In our scheme, the shared secret key is splitting and utilized to create a message authenticator which is broadcasted with the message and activating share. Our objective should attain the secret key splitting (using nearest conceivable) with confidentiality and authentication.

A secret sharing scheme begins to the secret and afterward gets from it certain shares (or shadows) which are circulated to clients. The secret may be recouped just by specific gatherings which fit in with a foreordained access structure. In the first secret sharing schemes just the quantity of shares was essential for recouping the secret. The secret may be recouped just by certain foreordained gatherings which fit in with the access structure.

The rest of this paper is organized as follows: In Section 2 the related technologies are introduced to aid in understanding the proposed scheme. In Section 3, the crucial security prerequisites of a distributed computing environment are examined. In Section 4, the proposed scheme is discussed. In Section 5, the security analysis of proposed method .Finally we conclude in Section 6.

2. Related Technologies

2.1 Block Access Token

Data Node did not authorizes any entrance control on gets to its data block. At the point when client solicitation file gets to on Name Node, file consent checking occur. Approval choices are made with respect to whether the solicitation gets to those documents are allowed. However, when it to resulting data block gets to on Data Node, those approval choices are not made accessible to Data Node and hence such gets are not verified. File sanction checks are performed by the Name Node not the Data Node. By default, clients can access any block given only its block id. To solve this, Hadoop introduced the notation of block access token. Any Hadoop client requesting for data from HDFS needs to fetch the data blocks directly from Data Node. After it was fetches the block id from Name Node [2].

There should be a secure mechanism whether the utilizer privileges are securely passed to Data Node. The main purposes of the Data Node block access token ascertain that only sanctioned utilizer are able to access the data blocks stored in Data Node. Block access token is the token provided by Name Node to a Hadoop client to pass data access authentication information to Data Node. A secret key is that imparted by Name Node. The secret key that normally replenished toward Name Node also will be imparted to Data Node through a pulse. When the secret key that exchanged the middle of Name Node what’s more Data Node will be presented should assailant. The
scheme of the block access token will make shown up in Figure 1. The block access token is made out of a token ID and a Token Authenticator [2]. Its point by point structure is according to the accompanying

![Diagram](image)

Fig No.[1]: The structure of a block access token [2].

- **Key_ID**: Secret key classify utilized for making a Token Authenticator.
- **Owner_ID**: Token proprietor distinguishing proof.
- **Block_ID**: Block recognizable proof verified through the token.
- **Access Modes**: A comprises of a blending about block privileges; powers to peruse compose and duplicate.

The point when it needs will perform operations with respect to HDFS blocks, those clients utilize an extraordinary sort of delegation token called a block access token that the Name Node goes to the client in light of a Meta data demand. Those client use the block access token will check itself on Data Node. This is conceivable simply because the Name Node shares its secret key used to create the block access token with Data Node, so they can confirm block access token. Client demand a block-id, Name Nodes end the block-id, Data Node (where the block are reside) spot data to client. A single block may be replicated with a large number of Data Node.

### 2.2 Secret Sharing Scheme

A secret sharing scheme starts should a secret and following that gets starting with it specific share. The secret may be recovered just on account of having certain predetermined arrangement of shares. [5,6]. Similarly as a rule, a secret sharing tradition includes two stages, called sharing and reconstruction. We specify Shamir’s threshold secret sharing scheme in view of polynomial interpolation [5] and Blakely geometric threshold secret sharing scheme[6] invented two (k,n) threshold –based SSS independently in 1979. The usual idea behind "secret sharing" is to convey a secret to n diverse members so that any K member can reproduce the secret, any (k-1) or lesser members can't delight anything about the secret. As to particular actualize strategy for secret sharing, researcher have provided sufficient choice to us.

### 2.3 General Access Structure Scheme

The secret sharing schemes are methods intended to part a secret among a group of participants in a manner that the secret can be recreated just be specified group of participants (called authorized set) while unauthorized group of participants cannot do so[7]. This scheme is called perfect if an unauthorized subset of participants B ⊆ P pool their share, so that they can determine the value of K and unauthorized participant cannot determine anything about the value of K.

### 3. SECURITY REQUIREMENTS

Secure-key stockpiling:- With different sort of delicate data, the key should be ensured throughout stockpiling, transmission, and back-up processes. Insufficient key stockpiling will destroy knowledge of the known encrypted information.

Confidentially :- Information conveyed between data stockpiling server and client terminal will be meaningful by real substances. That is, unauthorized client will not be able to acquire any information.

Authentication :- Data stockpiling server should be skilled to validating whether the user are rightful entities, and permit only rightful user to obtain data.
Availability:- When high capacity data are transferred, it’s ensured that authentication and confidentiality occur.

Efficiency:- Only the base number of calculations ought to be performed to decrease regular overheads on the client terminals and data servers.

4. PROPOSED SCHEME

The Proposed scheme is divided into 3 steps

1. Construction of n secret key shares using nearest conceivable operation.
2. Reconstruct the secret by getting shared from qualified subset.

Stage 1: Splitting

Name Node Splits S (secret) Key into K parts: X1, X2, X3,..........., Xk.

Name Node sends Data Node (P_i) the share X_i, i=1,2,3,......,k, and the parts are nearest conceivable to one another parts. (In other words, X1=2X2= ...............S/K).

Stage 2: Reconstruction

All Data Node (P_i), i=1, 2, 3, 4, n circulation their share in the meantime when they need to recover the secret.

1) For each part X_i for i = 1 to K-1;
2) Temp = rand(m, X1)
3) Spread X temp evenly among X_i+1........Xk
4) X_i = temp

Shuffle the resulting list and P_i regains S by computing S= X_1+X_2+X_3+...+X_n

Most likely that secret key using nearest conceivable representational of the share provides for confidentiality regardless it doesn’t show authentication of the share.

That infers while sending the share to Data Node or while the Data Node gathers the share from the other Data Node, there may be hazard that an assailant block attempt and send a fake share which achieve bad secret key.

So to keep away from this kind of attack may be masquerade or modify the share, SHA-1 is being used which generate a fixed length of code for any length of input stream. So when Name Node produces the share he additionally creates the hash code for every one of the shares. At the same time circulates the share of the Data Node. Name Node conveys share and its hash code to a Data Node. Moreover that Name Node distributes those hash code for different share so that Data Node will get to share it with hash code. Proceeding stockpiling those shares and the hash code, every Data Node could check to that genuineness for its share by ascertaining hash code for those accepted share. Eventually whether those accepted hash code and the ascertaining hash code would same at that point that Data Node might store the share and the hash code in its memory. These ascertaining hash code will be compared for those stockpiling hash code to every of the Data Node, whether those code match afterward the share would right once which would sent toward the verified authenticated Data Node.

Example : Name Node generate n share S_1,S_2,S_3,...........,S_n, and their corresponding hash code h_1,h_2,h_3,........,h_n. Name Node circulates the share to Data Node in the following way:

D_1: S_1, h_1, h_2,......,h_n
D_2: S_2, h_1, h_2,......,h_n

: 
: 
:

D_n: S_n, h_1, h_2,......,h_n

The moment that the Data Node received these they store their share and distinctive hash code in the memory. It also confirms if the share is the original one or the changed one by computing the hash code. Despite the fact that those code are same it will hold each and every one of data else it cam-wood reject What’s more short informs the same of the Name Node.
5. SECURITY ANALYSES
In our scheme, the nearest conceivable method to accomplish our objective by splitting shared key in the way that S=X1+X2+…..Xn. First of all the S is divided into shares, something like that no single share breaks at whatever majority of the data over those key. In such way protect information from unauthorized participants (Data confidentiality). The shared secret schemes are used to generate the key which is broadcast with the hash function. We utilize a hash function will provide for a data authentication.

6. CONCLUSION
Hdfs architecture is a huge and complex architecture, where in a single cluster large no of Data Nodes is dependent on a single Name Node. Data Node doesn’t have any access and control mechanism. Traditionally Each Name Node generates number of secret key and distributes them to the Data Node. If any how any attacker intercepts any one secret key then he can easily fetch the data from Name Node and misuse it. Here in this paper, we present a productive shared secret key splitting method, where the Name Node splits secret key into n number of partition and send those partition to the Data Node like X1…Xn. now each Data Node is having a part of key instead of the whole key itself, if any attacker intercept one or two part of the secret key it is not possible to lose the data confidentiality. He has to have K-I number of part to recover the secret key. After that we have used hash code for authentication. This way better security and authenticity can be achieved.

REFERENCES
UTILIZING THE SMART PV CONVERTER FOR THE BENEFITS OF AC POWER SUPPLY

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ABSTRACT

This paper presents a power electronic circuit, connected to the grid, which has an ability to overcome the problem of variation of both power factor and total harmonic distortion due to the nature of loads. Also the suggested circuit may be used to utilize the photovoltaic (PV) cells if solar energy is available. The power electronic circuit contains mainly transistorized voltage source inverter and solar cell system. This system is named as Static Power Components Compensation (SPCC). The SPCC has an ability to inject all the power components in to each phase of the AC power supply. These power components are real, reactive and distortion power components. The SPCC system is controlled using methodology of adaptive pulse width modulation (APWM) which drives the transistorized voltage source inverter. The analytical and simulation results are given which show the ability and benefits of the proposed method.

Keywords: Power Quality, PV converter, Active Filter, Statcom, Distortion Power.

1. INTRODUCTION

Power quality of the AC power supply is the main concern for both supplier and the customer. Since the loads, which are connected to the supply, have wide nature of random nonlinearity and inductive or capacitive. Therefore the quality of the power supply is affected adversely. In order to reduce the problems of inductive or capacitive and nonlinearity of the load, many approach had been used. The inductive or capacitive effect is compensated by using static compensators such as STATCOM [1]. While the nonlinear effect is compensated using active power filter [2,3]. Recently system called SRPDC, which solves the problems of both reactive and capacitive with nonlinearity of the loads had been proposed. This paper is suggesting a modified circuit, which can utilize SRPDC, by injecting real power component if solar cell is connected. This means that all power components, real, imaginary, and distortion power components may be delivered by the suggested circuit. The suggested circuit is named as Static Power Components Compensation (SPCC). The real power compensation is produced by the PV cells. Therefore the amount of solar energy depends on the size of PV cells as well as the availability of the sun light.

The power produced by the PV must be trained so as to be efficiently utilized. In order to utilize PV energy, buck – boost converter was used to transform variable DC voltage to regulated DC voltage, and then converted again to AC voltage, by using the voltage source inverter. The annual solar energy output of a PV system depends on the number of solar cells. The loads may be stand-alone or grid- connected, in case of the grid connected loads the system make full use of MPPT because the grid has the ability to absorb all the amount of the power generated by the PV cell system [4-7]. Proposed scheme based on using both buck-boost converter and a STATCOM to improve the power quality [8].

2. THEORY OF THE PROPOSED METHOD

The main power components of any power source with linear and nonlinear loads are expressed into apparent power, real power, reactive power and distortion power components. Each of these components can be expressed as follows [9,10]:

\[ S^2 = V^2I^2 \]  \hspace{1cm} (1)
\[ S^2 = \sum V_n^2 \sum I_n^2 \]  \hspace{1cm} (2)
\[ S^2 = P^2 + Q^2 + D^2 \]  \hspace{1cm} (3)

Based on Fourier analysis, the power components are presented as follows:

\[ P_1 = V_1I_1 \cos \theta_1 \]  \hspace{1cm} (4)
\[ P_n = \sum V_n I_n \cos \theta_n \hspace{2cm} (n=2,3,4,\ldots) \]  \hspace{1cm} (5)
\[ P = P_1+P_n \]  \hspace{1cm} (6)
\[ Q = \sum V_n I_n \sin \theta_n \hspace{2cm} (n=1,2,3,\ldots) \]  \hspace{1cm} (7)
\[ D = \sum V_n I_n \hspace{2cm} (k \neq n= 1,2,3,\ldots) \]  \hspace{1cm} (7)
Where:
- $S$: apparent power (VA)
- $P$: real power (Watt), $P_f$ due to fundamental, $P_h$ due to harmonic components.
- $Q$: reactive power (VAr)
- $D$: distortion power (VA)

The system is designed to make the main AC source delivers or absorbs only the power, $P_f$, of the fundamental component of the load power if the PV cell is idle, sharing the real power of the fundamental component with the smart converter, or receive a real power from the smart converter. The aim of the used technique is trying to perform, toward the ideal case, the followings:

- Assuming the supply voltage is sinusoidal.
- Force the supply current to be sinusoidal and in same, or out of phase, with the supply voltage.
- The smart converter has an ability to provide the load by reactive and distortion power components. Also a real power can be injected to support the supply by PV through the smart converter.

![Diagram](image)

Figure (1) The main circuit elements with power flow components

Therefore the proposed system, as shown in Fig. (1), is designed to perform three functions at the same time. These functions are reactive compensation, harmonic minimization, and injecting real power. The analytical approach is:

\[ i_s = I_{isc} \sin(wt) \]
\[ i_s = (I_{ish} \cos(\omega t) - I_{ish}) \sin(wt) \]
\[ I_{ish} = \sum_{n=1}^{\infty} I_{ish} \sin(nwt - \Theta_{ish}) \]
\[ I_{isc} = I_s - I_{ish} \]
\[ I_{isc} = (I_{ish} \sin(\omega t) + I_{ish}) \sin(wt) + \sum_{n=2}^{\infty} I_{ish} \sin(nwt - \Theta_{ish}) \]

$i_s$: smart converter current
$i_s$: load current, $i_s$: source current, and
$I_{isc}$: amplitude of AC converted PV cell current.

As shown in Fig. 1 the power components is adjusted, to accomplish the aim of the research work, according to the following analysis: In case solar cell is functioning, the real power of the supply is

\[ P_{source} = P_{load} - P_{sc} \]
\[ Q_{source} = Q_{load} - Q_{sc} \]

For reactive power compensation,
\[ Q_{source} \leq 0 \text{, therefore } Q_{source} = 0 \]
\[ Q_{sc} = Q_{load} \]
\[ D_{source} = D_{load} - D_{sc} \]
For distortion power compensation,
\[ D_{source} \leq 0 \text{, therefore } D_{source} = 0 \]
\[ D_{sc} = D_{load} \]

As in equation (9) the supply current will be sinusoidal and its magnitude depends on the difference between the fundamental real component of the load current and the AC converted PV cell current. When PV cell current is less than the real part of load current, in this case the real power will be shared between smart converter and the main supply. While in case of sun light is absent, the PV cell current is zero, the smart converter is providing the load demand of reactive and distortion power only and the real power will be provided by the main supply. In all the above cases the supply current will be sinusoidal with minimum distortion and almost unity effective power factor.

3. THE SIMULATION OF STATIC POWER COMPONENTS COMPENSATION (SPCC)

To validate the analytical approach, MatLab-Simulink is performed. Fig. 2, represents single phase of SPCC, including PV converter, which is connected to both the load and the main AC supply. In order to inject all types of power components, the SPCC is controlled using pulse width modulation, which is adaptive (APWM), approach. The PWM base drive signal is generated by comparing between modulated signal with carrier signal. The
modulated signal depends on the difference between the reference supply current and the line current of SPCC as given in Eq. 18 and referring to Figs 4&5.

\[ I_{er} = I_S - I_{SC} \]  \hspace{1cm} (18)

According to this error signal, \( I_{er} \), the converter supplies the reactive and distortion components of the load current if the PV cell idle (no sun light) . While if the PV cell supplies DC current, in this case makes sharing for the real part of load current between PV cell and AC supply and the converter supplies also the reactive and distortion parts of the load current. This means that the converter performs two operations at the same time, the sharing of the real part of load current, depends on the amount of the real power supplied by the PV cell and both reactive and distortion power compensations.

![Diagram](image1)

**Figure (2) Single phase of SPCC system.**

To explain the system operation it is important to understand the purpose, function and contains of each block. The full bridge converter, Vsc, is shown in Fig. 3 which contains four power MOSFET transistors with feedback diodes. The converter functions in both, inversion and rectification, modes.

![Diagram](image2)

**Figure (3) The full bridge voltage source converter scheme**

The drive control circuit is, shown in Fig. 4., the most important part in the system, it performs the controlling action of the smart converter current. The gate signal, for each power switching transistor, is a real time variable pulse width modulation (APWM) pattern which is effectively control the converter circuit to fulfill all the requirements.

![Diagram](image3)

**Figure 4. The control circuit diagram**

This APWM pattern, Fig. 5., is reflected as output voltage and current of the converter circuit which is connected to local grid through the conductor. The analogue waveforms, sample of the output desired, actual signature currents and their difference, for converter circuits, are shown in Fig. 6. This difference is converted into digital APWM difference or error signal as shown in Fig. 5.
4. **PV MODEL**

The equivalent PV model is commonly known as given in Fig. 7. $I_{ph}$ is the photo-generated current which is directly proportional to the radiation occurrence to the PV surface. The $I_d$ is the forward current between p-n junction of the cell bulk material which is behaving as a diode. $I_{RP}$ is the current passing through the shunt resistance, $R_p$, which causes drop in the voltage. The $I_P$ related to recombination of electron pair that are going to the load. Also due to the forward conduction of p-n junction, a series resistance, $R_s$, is represented. The $R_s$ and effective load, $R_L$, resistance are connected in series. The PV current or load current, $I_{PV}$, can be calculated as follows:[6-7]:

$$I_{ph} = I_d + I_{RP} + I_{PV}$$

Where the PV current can be expressed as:

$$I_{PV} = I_{ph} - I_d - I_{RP}$$

The maximum power point tracking is very important in PV systems so that the system always gives maximum power. In this paper and by using buck-boost converter, the effective output converter voltage is regulated and stabilized at constant magnitude, while direct PV voltage is variable. This is achieved by pulsed width control signal. Fuzzy logic controller FLC is used to perform the control process based on generate the control signal [11].

5. **SIMULATION RESULTS**

The simulation is based on Matlab/Simulink program and it is divided into two main cases. The first case depends on the type of loads (linear and/or nonlinear loads). The second case includes four PV cell operating conditions. These conditions are; the PV energy is zero, or less, or equal, or more than energy required by the load. The model is based on any type of load. A sample of results are presented by considering an inductive load, due to the most types of loads are inductive in nature. The obtained results are:

Case 1: Linear load. PV cell is idle:

The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 8. , there is no energy from PV cell, and the effective input power factor, $EPF$, is improved from 0.58 lagging to almost
unity, see Table 1. Fig. 9 shows the spectrum of both the load, assumed linear, and the supply due to using converter circuit which cause THD is slightly increased to 2%.

![Figure 8](image)

Figure (8) The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.

![Figure 9](image)

(i) ![Figure 9](image)

(ii) ![Figure 9](image)

Figure (9) FFT analysis for (i) load current & (ii) supply current

Table 1. System power component values, case 1., for linear inductive load.

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<th>Load</th>
<th>Smart Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0.5698</td>
<td>1</td>
<td>0.8134</td>
</tr>
<tr>
<td>P</td>
<td>0.5749</td>
<td>0.5797</td>
<td>-0.0218</td>
</tr>
<tr>
<td>Q</td>
<td>0.0017</td>
<td>0.8148</td>
<td>0.8129</td>
</tr>
<tr>
<td>D</td>
<td>0.0162</td>
<td>0.0027</td>
<td>0.0188</td>
</tr>
<tr>
<td>EPF</td>
<td>0.9998</td>
<td>0.58</td>
<td>-0.027</td>
</tr>
<tr>
<td>THD</td>
<td>0.02</td>
<td>0.003</td>
<td>0.022</td>
</tr>
</tbody>
</table>

Case 2: Linear inductive load with PV power is less than real part of load power:

The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 10., there is an energy converted from PV cell but its value is 50% of the real power required by the linear load. The EPF is improved from 0.61 lagging to almost unity, see Table 2, also due to PV power utilization and reactive power compensation, the apparent power supply is reduced by 70%, but THD is increased to 5% due to the PV converter circuit.

![Figure 10](image)

Figure (10): The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.
Table 2 System power component values for Case 2.

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>Source p.u.</th>
<th>Load</th>
<th>Smart converter p.u.</th>
</tr>
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<tbody>
<tr>
<td>S</td>
<td>0.3041</td>
<td>1</td>
<td>0.8496</td>
</tr>
<tr>
<td>P</td>
<td>0.3038</td>
<td>0.6101</td>
<td>0.3064</td>
</tr>
<tr>
<td>Q</td>
<td>0.0002</td>
<td>0.7924</td>
<td>0.7921</td>
</tr>
<tr>
<td>D</td>
<td>0.0162</td>
<td>0.0027</td>
<td>0.0189</td>
</tr>
<tr>
<td>EPF</td>
<td>0.9986</td>
<td>0.61</td>
<td>0.36</td>
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<tr>
<td>THD</td>
<td>0.05</td>
<td>0.002</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Case 3: Linear inductive load ,PV power approximately equal to real part of load power:

The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 11. The source current is almost zero. In this case the energy converted from PV cell and its value is equal to the real power needed by the load. The PV converter compensate both the reactive and real power components of the load. Therefore the apparent power of the supply, see Table 3, is almost zero.

Figure (11): The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.

Table 3 System power component values for Case 3.

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>Source p.u.</th>
<th>Load</th>
<th>Smart converter p.u.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0.0157</td>
<td>1</td>
<td>1.001</td>
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<tr>
<td>P</td>
<td>0.0002</td>
<td>0.64</td>
<td>0.6397</td>
</tr>
<tr>
<td>Q</td>
<td>-0.0013</td>
<td>0.7681</td>
<td>0.7694</td>
</tr>
<tr>
<td>D</td>
<td>0.0156</td>
<td>0.0026</td>
<td>0.0182</td>
</tr>
<tr>
<td>EPF</td>
<td>-----</td>
<td>0.64</td>
<td>0.639</td>
</tr>
<tr>
<td>THD</td>
<td>-----</td>
<td>0.0025</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Case 4: Linear inductive load, PV power exceeds the real part of load power:

The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 12, there is an energy converted from PV cell but its value is exceeding the load real power by 45%. The source current is in anti-phase ,of 180°, with its voltage , with EPF is improved from 0.6l lagging to almost unity, see Table 2, and PV power is supplying the load and also injecting power to the grid with THD is 3.2%. The spectrum of the supply current is shown in Fig.13, it is almost no significant harmonic effects.

Figure (12): The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.
Table 4: System power component values for Case 4.

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>Source p.u.</th>
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</thead>
<tbody>
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<td>S</td>
<td>0.4445</td>
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<td>1.3429</td>
</tr>
<tr>
<td>P</td>
<td>-0.4442</td>
<td>0.6823</td>
<td>1.1249</td>
</tr>
<tr>
<td>Q</td>
<td>-0.0037</td>
<td>0.7294</td>
<td>0.7333</td>
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<tr>
<td>D</td>
<td>0.0145</td>
<td>0.0024</td>
<td>0.0169</td>
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<tr>
<td>EPF</td>
<td>-0.9994</td>
<td>0.6823</td>
<td>0.8377</td>
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<tr>
<td>THD</td>
<td>0.032</td>
<td>0.0024</td>
<td>0.0126</td>
</tr>
</tbody>
</table>

![Figure (13) FFT analysis for supply current](image1)

Case 5: Nonlinear inductive load, PV cell is idle:

The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 14. There is no energy from PV cell and the load contains nonlinearity which causes THD of 11% and the EPF of the load is 0.7 lagging, see Table 5. Using smart converter, causes improving both the EPF of the supply to almost unity and THD to 1.7%. This is also clear from Figure 15, which represents the spectrum of both the load and supply currents.

![Figure (14) The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.](image2)

![Figure (15): FFT analysis of (i) load & (ii) supply currents.](image3)
Table 5 System power component values for Case 5.

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>Source p.u.</th>
<th>Load</th>
<th>Smart Converter p.u.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0.7303</td>
<td>1</td>
<td>0.7052</td>
</tr>
<tr>
<td>P</td>
<td>0.7301</td>
<td>0.7060</td>
<td>-0.0242</td>
</tr>
<tr>
<td>Q</td>
<td>0.0035</td>
<td>0.6997</td>
<td>0.6961</td>
</tr>
<tr>
<td>D</td>
<td>0.0126</td>
<td>0.1091</td>
<td>0.1101</td>
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<tr>
<td>EPF</td>
<td>0.9998</td>
<td>0.7060</td>
<td>-0.0344</td>
</tr>
<tr>
<td>THD</td>
<td>0.017</td>
<td>0.1098</td>
<td>0.1581</td>
</tr>
</tbody>
</table>

Case 6: Nonlinear inductive load with PV power supply less than the load power: The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 16. Third of load real power is supplied by PV cell, while the rest, which is two third, is supplied from the main grid. The EPF is improved from 0.73 lagging to almost unity, see Table 6, also due to PV power utilization and reactive power compensation, the apparent power supply is reduced by 50%, and THD is reduced from 11.3% to 2.6%. Fig. 17 shows the spectrum of the supply current with low significant harmonic components.

Figure (16): The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.

Figure (18) FFT spectrum of the supply current

Table 6 System power component values for Case 6.

<table>
<thead>
<tr>
<th>Measured item</th>
<th>Source p.u.</th>
<th>Load</th>
<th>Smart Converter p.u.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0.4996</td>
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<td>0.7163</td>
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<tr>
<td>P</td>
<td>0.4994</td>
<td>0.7349</td>
<td>0.2354</td>
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<tr>
<td>Q</td>
<td>0.0019</td>
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<td>0.6671</td>
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<td>0.1128</td>
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<td>EPF</td>
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<td>THD</td>
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<td>0.1595</td>
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</table>

Case 7: Nonlinear inductive load, PV power approximately equal to real part of load power:
The source voltage and currents waveforms, of the main elements of the system, are shown in Fig. 18. The source current is almost zero. In this case the energy converted from PV cell and its value is equal to the real
power needed by the load. The PV converter compensates the reactive, distortion and real power components of the load. Therefore the apparent power of the supply, see Table 7, is almost zero.

Figure (18) The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.

Table 7 System power component values for Case 7.

<table>
<thead>
<tr>
<th>Measured Item</th>
<th>Source p.u.</th>
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<td>0.7928</td>
</tr>
<tr>
<td>Q</td>
<td>-0.0014</td>
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<td>0.6005</td>
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<tr>
<td>D</td>
<td>0.0130</td>
<td>0.1100</td>
<td>0.1117</td>
</tr>
<tr>
<td>EPF</td>
<td>----</td>
<td>0.7930</td>
<td>0.7922</td>
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<tr>
<td>THD</td>
<td>----</td>
<td>0.1107</td>
<td>0.1123</td>
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</table>

Case 8: Nonlinear inductive load, PV power exceeds the real part of the load power:

The source voltage and current waveforms, of the main elements of the system, are shown in Fig. 19. There is an energy converted from PV cell but its value is exceeding the load real power by 33%. The source current is in anti-phase, of 180°, with its voltage, with EPF is improved from 0.82 lagging, with delivering power, to almost unity with absorbing real power only, see Table 2. This means PV power is supplying the real load power and also injecting power to the grid with THD is 4.7% while the load current has THD 11%. The spectrum of the supply current is shown in Fig.20, it has almost no significant harmonic effects.

Figure (19) The waveforms, from top to bottom, for: Source voltage; Source current; Load current and Smart converter current.

Table 8 System power component values for Case 8.

<table>
<thead>
<tr>
<th>Measured Item</th>
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<th>Smart Converter p.u.</th>
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</thead>
<tbody>
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<td>1.2368</td>
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<tr>
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<td>0.8222</td>
<td>1.0960</td>
</tr>
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<td>Q</td>
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<td>D</td>
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<td>0.1107</td>
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<td>0.8862</td>
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<tr>
<td>THD</td>
<td>0.0476</td>
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<td>0.08992</td>
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</table>

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6. CONCLUSION

A simulation of the SPCC is implemented. A novel control technique has been implemented to fulfill the following goals. The goals are concerning PV power utilization, reactive and distortion power compensations of the grid. Usually the loads, which are connected to the grid, are random in nature. The proposed SPCC circuit try to deal with these kinds of loads in addition to recover the PV energy. The suggested circuit deals with these goals as one unit instead of using three controller units. The obtained results show the consistency, convenience and superiority of the system for utilizing the PV energy and improve the power quality of the grid.

7. ACKNOWLEDGMENT

The authors are grateful for financial and Technical support from the University of Mosul, Iraq.

REFERENCES


PERFORMANCE, COMBUSTION, AND EMISSION CHARACTERISTICS OF COMPRESSION IGNITION ENGINE WITH DIFFERENT COMPRESSION RATIOS - AN EXPERIMENTAL INVESTIGATION

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Corresponding Author Email: ilango2507@gmail.com

ABSTRACT

The Experimental Investigation on Compression Ignition Engine was analyzed in different compression ratios by using Diesel as a fuel. Different volumes of Piston heads were employed to achieve compression ratios. In that respect are different compression ratios used, namely 16.5, 17.5 and 19.5. The investigation was taken from single cylinder, four-stroke, air cooled diesel engine. The observational results of a compression ignition engine indicated that an overall brake thermal efficiency was increased at part load conditions of all compression ratios. The emission characteristics of carbon monoxide were increased at peak load conditions at the compression ratios of 16.5 and 19.5. Unburned hydrocarbons were increased in the compression ratio of 19.5 in all load conditions. Overall oxides of nitrogen were reduced by 50% at the compression ratio of 16.5. The experimental result shows that compression ratio of 16.5 was suitable to operate in compression ignition engine comparable to other compression ratios.

Keywords: Performance, Combustion and Emission, Compression Ratio, CI engine.

1. INTRODUCTION

The diesel fuelled engines are widely applied to control emission characteristics and improve better efficiency. Compression ignition engine was provided, good efficiency and emission characteristics compare to spark ignition engine. The compression ratio of an engine has to achieve a self ignition temperature inside the engine cylinder. In case of a spark ignition engine the range of compression ratio was 6 to 10 for homogeneous operation, for compression ignition engine the heterogeneous operation takes place; here the range of compression ratio range was 16 to 20. There are several methods to improve efficiency and control emission parameters; induction gas heating, various compression ratios, Exhaust gas recirculation etc. The objective of this investigation is to achieve lower emission characteristics and improve brake thermal efficiency using different compression ratios using diesel fuel.

Raheman et al. (2008) investigated about the performance of the Ricardo E6 engine by using various compression ratios (18.1–20:1) and ignition timing (35 to 45° before TDC) with biodiesel. By increasing the quantity of biodiesel blends, the functioning of an engine at different compression ratios and injection timings was discussed. Sejal Narendra Patel et al. (2012) analyzed the diesel engine at various compression ratios fuelled with diesel and biodiesel blends. The different compression ratios such as 14, 16, and 18 were tested with biodiesel/diesel blends. The experimental results indicated that diesel-biodiesel blend B20 at a compression ratio of 18 had good combustion and emission characteristics. Similarly, the experiment was conducted at different compression ratios such as 16.5, 17.5, and 19.5. Porpatham et al. (2011) investigated about the effect of compression ratio on performance and combustion characteristics of a modified engine. In this study a single cylinder diesel engine was modified and operated as biogas spark ignition engine at compression ratios between 13.1 and 15.1. The peak pressure is increased or decreased depends on variation of compression ratios. The heat release rate is increased with increase in compression ratio. HC and CO emissions were low, but increases in NOX level.

N.Ravi Kumar et al. (2013) reported that the effect of compression ratio and EGR were taken out in direct injection diesel engine. The experiment results indicate that the brake thermal efficiency is increased and fuel consumption is decreased with increasing compression ratio. The emission characteristics of NOX were decreased with a raise in EGR by 11% to 85% and intensity of smoke is also decreased by 17% to 4% at different compression ratios.

Mohammed EL Kassaby et al. (2012) reports that the effect of compression ratio fuelled with waste oil produced biodiesel/diesel fuel in a diesel engine. The different compression ratios were used in this engine such as 14, 16, and 18. The experiment analysis results that the brake thermal efficiency was increased by means of varying the compression ratios with various fuel blends. The emission characteristics like CO2 and NOX were
increased, but CO and HC emissions were reduced, then the delay period is also decreased at various compression ratios.

2. EXPERIMENTAL SETUP AND PROCEDURE

The experimental investigation was conducted in single cylinder, four stroke, air cooled compression ignition engine shown in figure 1. The performance, combustion and emission characteristics were investigated using different compression ratios. The test engine consists of fuel and air flow meter, diesel fuel tank, Electrical dynamometer, digital indicator for exhaust gas temperature measurement. The emission parameters were measured using AVL five gas analyzer, AVL smoke meter and AVL software systems.

![Diagram of Experimental setup](image)

**Fig 1. Schematic diagram of Experimental setup**

**Table 1. Engine specification**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
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</tr>
<tr>
<td>Bore</td>
<td>87.5 mm</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>16.5:1, 17.5:1, 19.5:1</td>
</tr>
<tr>
<td>Cooling system</td>
<td>Air Cooled</td>
</tr>
<tr>
<td>Fuel</td>
<td>Diesel</td>
</tr>
<tr>
<td>Nozzle opening pressure</td>
<td>220 bar</td>
</tr>
<tr>
<td>Injection Timing</td>
<td>23 deg bTDC</td>
</tr>
<tr>
<td>Rated speed</td>
<td>1500 rpm</td>
</tr>
</tbody>
</table>

3. RESULTS AND DISCUSSION

In this investigation the performance, combustion and emission characteristics of a compression ignition engine using different compression ratio were analyzed through experimentation. The heat liberated from the engine and the pressure of an engine cylinder was also measured.

3.1 Performance Characteristics

Figure 2 represents the variation of Brake thermal efficiency with Load of a compression ignition engine compared between different compression ratios. The performance combustion temperature and cylinder pressure were increased because of using a different compression ratio. The ignition delay was controlled and performance of an engine, improved at higher compression ratios. Figure 2 demonstrates that the brake thermal efficiency was increased in part load conditions of all compression ratios, but rapid increase in peak load in the compression ratio of 17.5.
Figure 2. Variation of Brake thermal efficiency with Load

Figure 3. Variation of Specific Fuel Consumption with Load

Figure 3 represents the variation of Specific Fuel Consumption with Load. The compression ignition engine normally operated with lean mixture conditions. The misfire and the knocking were one of the causes for increasing fuel consumptions and it was also takes place during this engine operation. Because of lean mixture operations the fuel consumptions were controlled and reduced. Figure 3 indicated that the fuel consumption was observed maximum at initial load conditions. But lesser fuel consumption was observed at the compression ratio of 17.5 compared to other compression ratios.

Combustion and Emission Characteristics

Figure 4. Variation of in-cylinder pressure with Crankangle

Figure 4 shows the variation of in-cylinder pressure with Crankangle. The in-cylinder pressure analysis indicated the combustion characteristics of an engine. The above diagram represents the start of combustion, pressure rise rate and cylinder pressure of an engine. The rate of pressure rise was maximum by increasing loads; it results higher rate of combustion takes place. This experiment resulted that the peak cylinder pressure was obtained at the compression ratio of 17.5 and 19.5. The minimum cylinder pressure was obtained at the compression ratio of 16.5.

Figure 5 shows the variation of Heat Release Rate with Crankangle. In compression ignition engine operation, knocking and misfire can take place during the operation of high and low load conditions. The lean mixture operation tends to reach the heat release rate close to TDC with higher flame speed. The different compression ratios of compression ignition were to reduce abnormal or uncontrolled combustion. The above figure shows that the maximum heat release rate was obtained from a compression ratio of 16.5 and 19.5, as the compression ratio of 17.5 minimum heat release rate was obtained.

Figure 6 shows the variation of Carbon monoxide with Load. The rise of temperature in engine cylinder leads to decrease carbon monoxide emissions. The point of maximum temperature occurs inside the engine cylinder the induction fuel may completely burn, if the temperature level is low there were no possibilities to make carbon dioxide (CO₂). It can control by using higher oxygen content fuel during the combustion operation. In this study, the combustion temperature was increased during peak load conditions of different compression ratios. The carbon monoxide emissions were decreased in part load conditions of all compression ratios, but rapid increase in the peak load condition of the compression ratios of 16.5 and 19.5.
Figure 7 shows the variation of Unburned Hydrocarbons with Load. The engine cylinder gets low temperature combustion it may formed unburned hydrocarbon particles. It can be restricted to the oxidation process during low temperature combustion, to reduce those emissions by the complete burning process. It can also controlled by using an exhaust gas recycling process. In this figure 7 represents the unburned hydrocarbons were increased in all load conditions of the compression ratio 19.5. Here, in part load and peak load conditions the emissions were reduced in the compression ratios of 16.5 and 17.5.

Figure 8 shows the variation of Oxides of Nitrogen with Load. The compression ignition engine gets lower oxides of nitrogen emission with different compression ratios. The raise of oxides of nitrogen depends on combustion temperature, lower emission occurs in low temperature combustion and higher emission occurs in high temperature combustion. Here the figure shows that the low temperature combustion occurs during the compression ratio of 16.5 at all load conditions. The other compression ratios of 17.5 and 19.5 were increased the emissions at all load conditions because of high temperature occurs during this operation. Overall oxides of nitrogen were reduced at the compression ratio of 16.5 by 50% compared to other compression ratios.

Figure 9 shows the variation of smoke with load for compression ignition, operated with diesel as a fuel. The experimental result shows that the level of smoke was initially low at part load conditions of all compression ratios. But the rapid increase of smoke was obtained at peak load condition of the compression ratios of 16.5 and 19.5. Here, compression ratio for 17.5 was decreased compared to other compression ratios.
4. CONCLUSIONS

According to this investigation the effects of compression ratio were tested in compression ignition engine fuelled with diesel. The performance, combustion, and emission characteristics were also examined. The Conclusions are summarized as follows,

- The investigation shows that the compression ignition engine was worked under all compression ratios fuelled with diesel.
- Overall brake thermal efficiency was increased in all compression ratios.
- Reduction in oxides of nitrogen was observed 50% at the compression ratio of 16.5.
- The carbon monoxide emissions were increased at peak load conditions of the compression ratios 16.5 and 19.5.
- Unburned hydrocarbons were increased in all load conditions of 19.5 compression ratio.

REFERENCES


COMPUTED TOMOGRAPHIC LUNG LOBE SEGMENTATION USING
ACTIVE CONTOUR MODEL

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ABSTRACT

Apportioning an image into its integral sections with regards to its intensity or texture is known as Image Segmentation. Investigating the images is a very useful tool in medicine. In order to complete the process and analysis of medical images, the demands of computers are increased with respect of the size and number of the medicinal images. The knowledge of customary and ailing framework are enhanced by the preface of Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Digital Mammography. These are treated as critical components in disease identification and to plan the cure process. In most of the bio–medical applications, image segmentation algorithm plays an imperative role. This involves, computation of tissue volumes, analysis, localization of pathology, learning of anatomical composition, planning for the cure process and treatment with computer system. Computed Tomography has become a significant tool in therapeutic imaging to harmonize X-rays, medicinal ultrasonography and MRI. It is used in the early stages of screening diseases, for example, patients affected with a high risk of colon cancer is identified with CT colonography. The probability density functions of parameters such as location, size, and image intensity (e.g. computed tomographic [CT] attenuation value) are used to provide the knowledge about the anatomic patterns to be segmented. This gives the statistical information about the images to be segmented.

Active contours produce sub regions with continuous boundaries. The active contour algorithm is mainly appropriate for incorporation with elevated level of image perceptive skeletons, providing a strong and straightforwardly controlled low-level segmentation tool. The earlier results of the segmentation algorithm at chest image analysis suggest that which is comparable to that of more time-honored segmentation skills like growing the regions and applying the morphological operators. The active contour–based system, in some cases, may smash the usual segmentation methods due to its competence to fully impose the availability of previous knowledge with reference to the anatomic structure of awareness. In order to determine whether the proposed algorithm is undeniably capable of providing consistently superior segmentation, further processing is carried out. The segmentation algorithm provides the segmented parts of lungs such as fissures and lung lobes.

Keywords: Bio-medical imaging, active contour algorithm, computed tomography

1. INTRODUCTION

Magnetic Resonance Image and Computed Tomography Images are formed by optical devices. To diagnose lung and chest problems, to determine the bone injuries Computed Tomography scanned images are useful. For the image analysis applications such as remote sensing, medical image analysis and object detection in military segmentation is mainly used. Segmentation defines the process of dividing the images into multiple sub-regions based on the features such as location, color, intensity and texture. The basic and disjoint sub-regions are identical based on these properties. The two main divisions of image segmentation are: Edge oriented segmentation and Region oriented segmentation. The edge oriented segmentation is one which looks for the irregularities in the intensity of an image. Region oriented segmentation aspects for evenness surrounded by the subordinate region based on any of the desired property. In this paper, a deviational formulation is measured to the lung segmentation by means of active contour models.

Active contour methods are connectivity stabilizing lessening methods [1] which are applied in the image segmentation problems. The initial overview of snakes in Kass et al.[2] described it as proscribed permanence spline under the image forces. It was used for the image boundary tracking problems and segmentation. The basic idea is to begin from the frontier shapes represented as contours and consequently change them by application of shrink or stretch operations in accordance to the limitations of images. The contour evolution such as the shrink or stretch operations, which are done in minimizing the vigorous functions like fixed region oriented segmentation methods or the reproduction of geometrical partial differential equation [3]. The benefits of active contours as image segmentation method is that, they divide the image into sub-regions with continuous margins and the border detectors are based on the threshold or confined filtering, e.g. canny [4] or sobel operator, regularly results in uneven
Applying the level set theory had provided more tractability and accessibility in the completion of dynamic contours. Relying on the execution method, dynamic contours can use different properties such as boundaries, figures and quality. In this paper, the proposed contour model using the arithmetical data [5] of image are used to fragment the entire lung area and to classify the unfamiliar part (diseased area) on computed tomography images.

In reality, to differentiate between the blood vessel and anomalous area such as lung cancer, lung nodules on thorax computed tomography images in ground glass opacity, computed tomography values are hardly used. Two approaches are mainly applied to segment the region of interest: Rule based reasoning [6-8] and pixel classification [9]. Newly, a reading on an active contour model has been lengthened in the segmentation of lung areas. Several methods have been approached for extracting abnormal areas in lung region, based on three dimensional or two dimensional characteristics and elevating its correctness. In this proposed method, primary outline points are inevitably agreed for the processing of lively contours by comprehensive segmentation and by the threshold based on computed tomography rate. The dilatation processing of extracted lung areas are used to repair fissure divisions. After that, the final lung areas are detected by employing the SNAKES technique. Furthermore, some interpolating points based derive computed tomographic values are inserted with the intension that contour does not come within the region of interest whilst adding the control points between outline points. Finally, the lung region is segmented with the preferable information like fissures and lobes.

2. METHODS

Flow diagram in accordance with the procedure of segmenting the lung areas are shown in Figure 1. In the initial step, the noise present in the image is removed by the application of effective filters such as neighborhood mean filter and median filter. Then lung areas are extracted by preferring the threshold depending on computed tomography rate. This experimented point on the initial outline is considered as the obsolete point of SNAKES. The final lung region is derived by using SNAKES automatically.

A) NOISE REMOVAL

The initial step is the removal of noise. The noise removal is the process of removing the unwanted noise in the image. It involves operations upon an image with the aim of producing another image which is improved in some respect. The reduction of noise may greatly improve the performance of analysis procedures. The main advantages of this process in enhancement of certain properties of the images are the lessening of noise, alteration of distortion.

B) LUNG SEGMENTATION

The human lungs are separated via fissures into lobes (Figure. 2). There are two lobes such as upper and lower in the left lung which are typically divided by one slanting fissure and there are three lobes such as upper, middle, and lower in the right lung which are divided by one slanting fissure and one parallel fissure.
The twofold layers of in-folded transposition of visceral pleura are typically available in the major fissures of a healthy lung. In each lobe, both bronchial and vascular systems are mainly seceded with negligible associations among lobes, and the lobes can be consider as quite self-governing functional units. That’s why illnesses of numerous types may establish in and/or to be limited to a personage lobe in the early stage. In order to identify and characterize the chronic diseases, such as chronic obstructive pulmonary diseases and interstitial lung diseases a computerized scheme for lung lobe segmentation may not be convenient but, it should also be helpful to facilitate preoperative planning and postoperative assessments [10], [11]. In addition to that, the registration of intrapatient and evaluation of chronological imaging procedures are also to be done [12],[13]. Unfortunately, manually performing this task is time consuming and very difficult, because of the need to rationally track and rearrange three dimensional outlines of lung fissures, that frequently extent over numerous computed tomographic images. This job is mostly not practical with sub millimeter thin-section computed tomography analysis. Everywhere hundreds of pictures are obviously produced in each examination. Hence, a strong computerized lobe- segmentation system is developed and it can be extremely beneficial for routine experimental observations. It is most significant for computable lung image examination [14]. Respiratory lobe- segmentation begins with the detection of respiratory fissures. Anatomical landmarks are used to separate the lobes from each other. It is quite difficult to attain an exact even segmentation of lobes if a known fissure position is given. It is because fissures shown on computed tomography images are usually incomplete. The generally used algorithms such as region growing or flooding operations may escort to a combination of the region of interest with neighboring lobes. The lobe segmentation methods can be classified into two broad categories such as anatomy knowledge based and shape analysis based schemes. Depend on either local or global knowledge of the anatomy of lung structure is known as anatomy knowledge based structures. As described in Kuhnigk et al. [15], there should not be any large vessels in the locality of pulmonary fissures and lobes are identified using a two way three dimension watershed algorithm.

The lung fields are segmented with an automatic three dimensional procedure analogous to the algorithms suggested by Sluimer et al. [16] and Hu et al. [17]. The steps involved in this algorithm are:

1) The key portions of the respiratory tree are set up using region growing. A start point for this tree is dogged by probing for an attached section on an axial slice that matches the specific size, location, and shape standards.

2) Each slice is examined starting at the top still an appropriate region is found. Within this region, the position with the bottommost Hounsfield value is reflected as the start position. Beginning this start point, the trachea and main stem bronchi is developed by means of burst measured region growing. The method revenue to, in each iteration the inception applied is marginally enlarged and the grown-up structure is stationary when the size rises by a cause of two compared to the earlier threshold. Such a bulk raise indicates that the bronchi have fused with the lung parenchyma. From the strong-minded structure, the point with the lowest Hounsfield value is reserved as a start point for the next step.

3) Beginning with the new start point, region growing is applied to find the lungs. The upper entry for this region growing operation is determined by optimal thresholding as described by Hu et al. [17].

4) The outputs of first step such as trachea and bronchi are separated from the results only after the lungs are developed. This leads to find only the lungs. On occasion, only one linked component is found. In those cases, the two lungs in left and right are separated by a small dissimilarity junction line that is the pleura. Active programming in axial slices is applied to separate the lungs, similar to Hu et al. [17].

5) By using three dimensional crack filling and morphological closing with a sphere-shaped constructing element, each lung is smoothed separately to embrace vessel in the segmentation and charming the borders. Figure 3 shows the sample results of the lung lobe segmentation with different slices.

Fig.2. Vertical view of the human lung.
3. EXPERIMENTAL ANALYSIS

Lung images around 100 from LIDC-MIDAS are taken and the experiment was carried out to find the PSNR values of images. The results are shown below:

Table 1: PSNR analysis

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Image Name</th>
<th>Value in 2007</th>
<th>Value in 2010</th>
<th>Value in proposed method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lung Image1</td>
<td>44.2</td>
<td>46.4</td>
<td>52.7</td>
</tr>
<tr>
<td>2</td>
<td>Lung Image2</td>
<td>45.8</td>
<td>48.9</td>
<td>54.3</td>
</tr>
<tr>
<td>3</td>
<td>Lung Image3</td>
<td>41.6</td>
<td>43.2</td>
<td>50.4</td>
</tr>
<tr>
<td>4</td>
<td>Lung Image4</td>
<td>44.8</td>
<td>46.3</td>
<td>51.2</td>
</tr>
<tr>
<td>5</td>
<td>Lung Image5</td>
<td>47.94</td>
<td>50.1</td>
<td>55.8</td>
</tr>
</tbody>
</table>

The below chart shows the comparison of PSNR values from different set of image analysis.

The PSNR rates of images in the proposed method are comparatively higher than the existing methods. This analysis indicates that, the proposed method is superior to the already presented methods.

4. CONCLUSION

A new lung segmentation scheme was developed and the experimental results are checked against the existing values. The fissures detection and lobe identification using SNAKES are time consuming and better results of these two matters are expected by applying the effective algorithms. The procedures involved in this method are applied only in geometric space and the segmented lung may enable the automated segmentation in CT image analysis.

REFERENCES


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DEMULSIFICATION OF HEAVY CRUDE OIL EMULSIONS USING SURFACTANTS

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ABSTRACT
Deposition of crude oil in the transfer lines is a common problem and hence need to be addressed. One of the possible ways to resolve this problem is by decreasing the viscosity of the crude oil. The objective of the work presented in this paper is to decrease the viscosity of heavy crude oil emulsions using surfactants. Diluent oil was explored as a surfactant and its effect on the viscosity, total petroleum hydrocarbon (TPH) and basic sediment and water (BS&W) is investigated for two samples of crude oil obtained from two different wells located at different locations in the Sultanate of Oman. It was found that the increase in diluent blended with emulsion results in a corresponding decrease in the values of both the viscosity and the BS&W which in turn causes the enhancement of rate of demulsification of the samples. Further it was also noted that increasing the volume of diluents oil decrease the value of TPH until an optimum volume was reached and then further increases with the increase in the diluents volume. Crude oil with optimum values of diluents and TPH is safe for other purposes in the field. Also, the water droplets can be removed easily from the crude oil.

KEYWORDS: Demulsification, Viscosity, Total Petroleum Hydrocarbon, Basic Sediment and Water, Emulsion, Crude Oil

1. INTRODUCTION
Crude oil is usually produced mixed with water which is commonly known as oil field emulsion. Regular oil field emulsion means dispersal of water droplets in the oil. Many of the emulsions sometimes are difficult to handle and usually leads to numerous operational problems particularly in the handling of wet crude facilities, as well as oil or gas separation units. Emulsions in flow lines at extremely high pressure at times cause trips or unrest in the wet rough handling facilities and usually leads to increased use of demulsifiers. In winter seasons, it gets worst due to the presence of low atmospheric temperatures in the surrounding [8,9].

Often the cost of separation of water from crude oil is more than the cost required in oil production. To separate the water contents from the crude oil and its disposal in the right way are often very expensive. The crude oil must meet the desired product specifications, including the values of salt and BS&W. Therefore, the water contained in the crude oil should be removed [4,5,6].

It is important to address emulsions in order to remove water and separate it including the associated inorganic salts to meet crude specifications for stores that transport and export the crude oil [1]. Removal of emulsion also reduces corrosion and poisoning of the catalyst in the downstream processing facilities [7]. Emulsions almost occur at all stages of oil production and processing in wellbores, gas stations or oil separation plants, inside the tanks and nozzles raw wet wells, etc. This causes an increase in viscosity which greatly affects oil production and even gets rid of the sand flowing. Inaccurate mixing of oil and water originates many problems, e.g., overcapacity of surface separation rates, increased soggy crude oil, and also corrosion. The problem of crude oil emulsification can be solved by decreasing the viscosity of crude oil.

2. METHODOLOGY
The TPH and BS&W of the crude oil samples were analyzed using standard methods as used by Ekechukwu and Young [2].

2.1 Preparation of Water Bath
Water bath is set up in such a way that its temperature is always maintained at 60°C which is equivalent to the average process temperature of the oil fields. The reason to hold the temperature constant is to nullify the effect of temperature on the viscosity of the crude oil samples.

2.2 Procedure
(i) Two samples of crude oil, viz., Nahad (Sample A) and Oman Export Crude (OEC) (Sample B) are collected from the wells located at two different locations.
(ii) Six testing bottles of 100 ml capacity of each sample are taken and numbered with suffixes 1 to 6.

(iii) Diluent from 0 mL to 10 mL was added to each bottle. Bottle number # 1 contained no diluents, bottle number # 2 contained 2 mL diluent, bottle number # 3 contained 4 mL, bottle number # 4 contained 6 mL, bottle number # 5 contained 8 mL, and bottle number # 6 contained 10 mL of diluent.

(iv) The samples (crude oil + diluent oil) are placed in a bottle shaker and agitated thoroughly with 50 vertical shakes and 50 horizontal shakes to homogenize the samples.

(v) After ensuring proper mixing of crude oil with diluent oil, the samples were kept in hot water bath for 10 minutes.

(vi) Finally, the percentage of free water, viscosity, TPH and BS&W values were measured. To measure viscosity and TPH values, viscometer and TPH analyzer are used respectively. While to measure BS&W value a slight overdose of a demulsifier is added to an emulsion, centrifuging it and allowing it to stand.

3. RESULTS AND ANALYSIS

The results showing the effects of diluents oil on viscosity, BS&W and TPH were obtained and discussed in the following subsections.

3.1 Effect of Diluent Oil on Viscosity

The results showing the effect of diluent oil on viscosity for the two samples under investigation are provided in Table-1.

<table>
<thead>
<tr>
<th>Diluents Oil (mL)</th>
<th>Viscosity (mm²/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample A (Nahad)</td>
</tr>
<tr>
<td>0</td>
<td>9.5301</td>
</tr>
<tr>
<td>2</td>
<td>9.1801</td>
</tr>
<tr>
<td>4</td>
<td>8.4219</td>
</tr>
<tr>
<td>6</td>
<td>8.2207</td>
</tr>
<tr>
<td>8</td>
<td>8.1969</td>
</tr>
<tr>
<td>10</td>
<td>7.9030</td>
</tr>
</tbody>
</table>

Diluent oil from 2mL to 10mL was added to the two crude oil samples and accordingly the volume of crude oil was reduced to keep a constant volume of the emulsion. The relationship between volume of diluent oil (mL) and viscosity (mm²/s) for crude oil A (Nahad) and crude oil B (OEC) is illustrated in graph of Figure-1. It can be observed from the graph that there is viscosity reduction when diluent is introduced. The reduction in viscosity shows directly proportional relation to the volume of diluent oil. The reductions of viscosity in fields A and B are 7.903 and 9.4180 mm²/s when compared to their initial viscosity of 9.5301 and 10.391 mm²/s respectively. There was maximum percentage reduction in viscosity in sample having the lowest value. On the other hand the sample with the highest viscosity showed the lowest percentage reduction [3,4].

![Figure-1 Effect of the diluent oil on viscosity](image-url)
3.2 Effect of Diluent on BS&W

The results showing the effect diluent oil on BS&W for the crude oil A (Nahad) and the crude oil B (OEC) are tabulated in Table-2. Figure-2 shows that introduction of diluent effects the BS&W of crude oil emulsions.

Table 2: Effect of Diluent Oil (%) on BS&W

<table>
<thead>
<tr>
<th>Diluent Oil (mL)</th>
<th>BS&amp;W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample A (Nahad)</td>
</tr>
<tr>
<td>0</td>
<td>0.09</td>
</tr>
<tr>
<td>2</td>
<td>0.06</td>
</tr>
<tr>
<td>4</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>0.05</td>
</tr>
<tr>
<td>8</td>
<td>0.03</td>
</tr>
<tr>
<td>10</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Figure-2 Effect of the diluent oil on BS&W

The BS&W of Field A crude oil emulsion sample without blending with diluent was 0.09% when treated with an injection rate of 1 ppm. The BS&W continuously decreases as the volume of diluent oil is increased and finally becomes 0.03 % with the addition of 8 ml of diluent oil and further remains the same when 10 ml of diluent oil was added. The same trend is observed for Field B where the value reduces initially from 0.08 to 0.024% up to the addition of 10 ml volume of diluent oil. The viscosity of emulsion also plays an important role in the analysis of BS&W. It was noticed that for Field A the BS&W reduces to 0.03% when the volume of diluent is 8 ml only while for Field B when the volume is 10 mL the value is at 0.024% when the volume of the diluent is at 10 ml. This indicates that as Field A has lower viscosity so the volume of diluent oil used is also less while Field B uses more volume of diluent since it has the higher viscosity. It can therefore be established that the diluent oil is capable of reducing the BS&W in crude oil emulsions.

3.3 Effect of Diluent Oil on TPH:

The results showing the effect diluent oil on TPH for the crude oil A (Nahad) and the crude oil B (OEC) are tabulated in Table-3.

Table 3: Effect of Diluent Oil on TPH

<table>
<thead>
<tr>
<th>Diluent Oil (mL)</th>
<th>TPH(mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample A (Nahad)</td>
</tr>
<tr>
<td>0</td>
<td>61.02</td>
</tr>
<tr>
<td>2</td>
<td>55.00</td>
</tr>
<tr>
<td>4</td>
<td>57.01</td>
</tr>
<tr>
<td>6</td>
<td>59.02</td>
</tr>
<tr>
<td>8</td>
<td>61.92</td>
</tr>
<tr>
<td>10</td>
<td>74.00</td>
</tr>
</tbody>
</table>

Figure-3 shows the graphical variation of TPH with diluent oil for the two samples under investigation. Sample A (Nahad) had a good TPH of 61.02 mg/L which reduced to 55.00 mg/L as the diluent volume was increased from 0 and 2 mL, but there is an increase in the TPH above 2 ml of diluent oil. Similarly, sample B (OEC) has an initial value of 50.70 mg/L which reduce to 46.70 mg/L with the addition of 2 mL of diluent oil. Further, it is to be noted...
from Figure-3 that the TPH of both the samples decreases initially as the volume of diluent oil is increased. However, it showed a sudden increase after the addition of 2ml in both the samples. The initial decrease and then hasty increase in TPH value with the increase in the volume of diluent oil may be due to the relative tightness of the crude oil emulsion. Tightness is the degree at which the water droplets are held in suspension and resist separation. This undesirable effect may have been caused by the excess diluent oil in the mixture that tries to find its way out into the aqueous phase.

![Graph showing the effect of the diluent oil on TPH](image)

Figure-3 Effect of the diluent oil on TPH

4. CONCLUSION

This paper described the effect of diluent oil on viscosity, BS&W and TPH values of the crude oil taken from two different wells, viz., Nahad and OEC.

(i) The reduction in viscosity of the two water-in-crude oil emulsions investigated has been found to be inversely proportional to the increase in volume of diluent oil. On comparison between the two oil samples it was observed that higher viscosity sample showed lower reduction in viscosity.

(ii) The BS&W reduces with increase in volume of diluent oil blended with the emulsion. Hence, it can be concluded that this also depends on initial viscosity of the emulsion before the addition of diluent oil.

(iii) Total petroleum hydrocarbon (TPH) decreases with the increase in the volume of diluent oil until an optimum concentration and then suddenly start increasing with further addition of the diluent.

5. ACKNOWLEDGEMENT

I would like to express my deepest appreciation to all those who provided me the support to complete this study.

REFERENCES


A STUDY ON TREATMENT OF INDUSTRIAL WASTEWATER USING LOW COST ADSORBENT METHOD

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ABSTRACT

The aim of this Paper is to study the adsorption process in the removal of emerging compounds. The treatment of wastewater was performed using low cost natural adsorbent, which is prepared from date palm seeds. Batch experimental studies was carried out to investigate the degradation of pollutants present in the wastewater and the effect of various parameters such as pH, biological oxygen demand (BOD), chemical oxygen demand (COD) and total dissolved solids (TDS), total suspended solids (TSS) and turbidity were evaluated. Different reaction parameters and conditions for adsorption processes were investigated.

Keywords: Activated Carbon, low cost adsorbents, industrial wastewater.

1. INTRODUCTION

The adsorption procedure is broadly utilized for treatment of modern waste water from natural and inorganic toxins and meets the immense consideration from the scientists. The quest for minimal effort adsorbents that have poison binding limits has heightened. Materials locally accessible, for example, normal materials, and rural squanders and modern squanders can be used as minimal effort adsorbents. Initiated carbon delivered from these materials can be utilized as adsorbent for water and wastewater treatment [1]. Date seeds are locally available abundantly in Oman, which are very low cost used as an adsorbent.

1.1 Advantages of Inverse Fluidization over Normal Fluidization

The benefits of inverse fluidization contrasted with ordinary fluidization in biochemical building are that it can control bio-film thickness in an extremely limit range. Some more focal points are the solids can be fluidized at low fluid speed, the vitality consumption is low furthermore the solids wearing down are least. Alternate focal points are the high mass exchange rates, least remainder of covered microorganisms because of less solids wearing down than typical fluidization and simplicity of re-fluidization if there should be an occurrence of force disappointment. A twofold blend of various densities of particles can be dealt with in reverse fluidization, as the lower thickness particles are especially near the wholesaler [2]. The inverse fluidization framework has increased huge significance of the most recent decade in the field of natural, biochemical designing, and oil–water detachment. It is likewise utilized as a part of the new advancements of polymer preparing, mineral recuperation, sustenance handling, biomedical designing and synthetic synergist process [2, 4, 5, 6].

1.2 Applications of Inverse Fluidization

The waste water treatment is a procedure of expelling contaminants and natural material from WW utilizing different strategies, frameworks and systems. A few physical, substance and organic techniques have been utilized for the treatment of WW. The nature of a decent WW treatment framework is demonstrated or dictated by the higher contamination debase/mineralization productivity without lifting a finger of operation. The different focal points of IF lead to its application in WW treatment. On the off chance that has been an effective instrument in the treatment of waste water from different wine, refinery and sugar businesses. The vigorous treatment of wastewaters has been researched in the opposite fluidized bed bio-film reactor (IFBBR) in which polypropylene particles of thickness 910 kg/m³ were fluidized by an upward co-current stream of gas and fluid. Estimations of substance oxygen request (COD) versus living arrangement time, t were performed for different proportions of settled bed volume to bioreactor volume, (Vb/VR) and air speeds u to decide the ideal working parameters for a reactor, i.e. the estimations of the parameters (Vb/VR), u and t for which the biggest decrease in COD occurred. Inverse fluidization innovation has been utilized for the anaerobic absorption of red wine refinery wastewater.

2. MATERIALS AND METHODS

2.1. Materials

The required amount of date seeds was collected from Oman local market; washed with distilled water and dried under sun. After drying, 1.5 kilo grams of date seeds was taken and soaked in 400 ml of phosphoric acid (H₃PO₄).
and kept for 24 hrs. After that, a batch of date seeds was poured in a metallic cylinder and it was kept in the furnace at 400 °C for 4 hrs to produce the activated carbon from date palms seeds. Then carbon taken from the furnace was washed with distilled water till the pH shows 7. After washing, the activated carbon dried in drying oven at 105°C for 1 hr, then grind using blender. By using sieve trays, two different sets of activated carbon of different sizes were prepared, which was subsequently used in the treatment studies.

2.2. Methods of Batch Experimental Studies Were Carried Out

The samples of wastewater from Rusayl industry (Oman Water Treatment Company SAOC (OWATCO)), are taken in conical flask placed in a shaker at about 100rpm, kept for five different durations to reach the optimum time for equilibrium adsorption by activated carbon particles. An optimum time of 60 minutes was found out from the initial equilibrium studies and it was fixed for all the rest of experiments. The samples were analyzed for Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, turbidity and its variations with respective contact time, size of adsorbent, dosage of adsorbent was evaluated. The initial characteristics of collected sample have been shown in table.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5.95</td>
</tr>
<tr>
<td>DO (ppm)</td>
<td>1.84</td>
</tr>
<tr>
<td>TDS (ppm)</td>
<td>10.0</td>
</tr>
<tr>
<td>TSS (ppm)</td>
<td>6.0</td>
</tr>
<tr>
<td>COD (ppm)</td>
<td>354</td>
</tr>
<tr>
<td>BOD (ppm)</td>
<td>1.3</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>4.0</td>
</tr>
</tbody>
</table>

3. RESULTS AND DISCUSSIONS

3.1 Effect of Contact Time

Samples in five labeled conical flasks (15min, 30min, 45min, 60min, 75min and 90min) were kept for shaking on the orbital shaker at about 100 rpm by adding 0.2g 600μm size activated carbon. After each time designated, it was taken out from the shaker, filtered and analyzed for various parameters. The optimum contact time was found to be 60min because the percentage reduction in most of the parameters remains constant and it seems equilibrium was reached by that contact time.

![Fig.3.1a. % reduction of turbidity, TSS and TDS with respective to time](image1)

![Fig.3.1b. % reduction of BOD and COD with contact time](image2)

Fig. 3.1a shows the percentage reduction of turbidity, total suspended solids, total dissolved solids and it was observed that the reduction of turbidity was higher initially and then decreases whereas a reverse trend was observed in the case of TSS and TDS. An optimum of 94% reduction in turbidity, 60% in TDS and 34% in TSS was achieved after 60min of contact time. Fig. 3.1b shows the percentage reduction of BOD and COD with respective time. Reduction of BOD was higher initially and then reduced to reach an optimum of 21%, whereas almost complete reduction was observed in COD after 60min contact time. Fig. 3.1c shows the variation of pH and DO with respective time and it was observed that the variation of pH
was marginal and there is a slight decrease in DO.

3.2 Effect of Adsorbent Size

Samples in five labeled conical flasks (75μm, 150μm, 300μm, 425μm and 600μm) were kept for shaking on the orbital shaker at about 100 rpm by adding 0.2g activated carbon in each flask. The shaking was allowed for 60min then it was taken out from the shaker, filtered and analyzed for various parameters. The percentage reduction in parameters was increased with increase in size of the adsorbent up to 400μm and then it was stable. This indicates that 400μm adsorbent size can be considered as optimum. A maximum of 96% reduction in Turbidity and TSS, 90% in TDS, almost 100% reduction in COD, 90% in BOD was observed as shown in Fig. 3.2a-3.2b. pH and DO slightly increased with increase in adsorbent size as shown in Fig. 3.2d.
3.3 Effect of Adsorbent Dosage

Samples in five labeled conical flasks (0.5g, 1.0g, 1.5g, F2.0g and 2.5g) were kept for shaking on the orbital shaker at about 100 rpm by adding 0.2g 400μm size activated carbon in each flask. The shaking was allowed for 60min then it was taken out from the shaker, filtered and analyzed for various parameters. The percentage reduction in parameters was decreased with increase in the dosage of the adsorbent up to 2g and then it was stable. This indicates that 2g of adsorbent dosage can be considered as optimum. A maximum of 95% reduction in Turbidity, 90% in TSS, 70% in TDS, almost 100% reduction in COD, 87% in BOD was observed at 0.5 dosage of adsorbent as shown in Fig. 3.2d-3.2e. pH and DO dropped significantly with increase in adsorbent dosages as shown in Fig 3.2f.

4. CONCLUSION

Treatment of Industrial wastewater collected from the industry in Oman was carried out using date palm activated carbon. It was observed substantial reduction in the pollutants in terms of COD, BOD, TDS, TSS and turbidity. The optimum contact time was observed to be 60 min. With increase in size of the adsorbent, the percentage reduction in TDS, TSS, turbidity, COD and BOD was increased and it was opposite in case of adsorbent dosage. pH and DO was marginally decreased with increase in size but with increase in dosage, it was dropped steeply.

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ABSTRACT
This paper focuses on employing weight loss and electrochemical methods to study pitting corrosion in stainless steels samples, namely, SS304, SS316, SS410, DSS2205 and CSA53 in hydrochloric acid (HCl) and ammonium chloride (NH₄Cl). Pitting corrosion is basically a localized form of corrosion wherein cavities or holes are formed in the material. The corrosion rates were determined and corrosion products were characterized by Energy Dispersive Spectroscopy (EDS). The morphology of the pits was studied by using Scanning Electron Microscope (SEM). The pit depth was determined by using KEYENCE VHX-1000 Digital Microscope. The maximum corrosion rate for weight loss experiments was observed in carbon steel CSA53. It was found that the duplex stainless steel DSS2205 and stainless steel SS304 show best resistance towards the environment. The anodic polarization tests were conducted on the samples in 1M NH₄Cl. The results show that highest corrosion rate occurred in CSA53 whereas DSS2205 did not show any corrosion. In addition, when the samples were exposed to 1M HCl at pH 3.77, all samples showed corrosion due to presence of aggressive chloride ions in the solution. Finally, it is concluded that the weight loss method results were in good agreement with the results obtained by electrochemical tests.

Keywords: Weight loss method, Electrochemical-test, Stainless steel, Carbon steel, Duplex stainless steel, Pit depth.

1. INTRODUCTION
Corrosion engineers face corrosion problems in terms of controlling; therefore it is essential to know the type of corrosion and the effect of corroding medium. On the other hand, metallurgy of the equipment or the pipe line is also a concern, since it is the part that handles the corrosive environment. For that reason knowing the type of materials used in the industries is a tool for the process and corrosion engineers in order to control the corrosion rate and satisfy the reliability and the economic aspects. As highlighted by NACE, “in the US, corrosion costs are estimated to equal $276 Billion per year, however this is estimated to rise up to $1 trillion, similarly, the worldwide annual cost is estimated to exceed $U.S.1.8” [4]. Corrosion is one of the major issues in oil refineries where the equipment and transfer lines suffer corrosion due to various aggressive conditions. Generally stainless steel is used to manufacture the refinery equipment. Even though stainless steel is considered to be corrosion resistant due to its passive nature, still it suffers from pitting corrosion [6]. Huge amount of research has been conducted to study the pitting behavior of stainless steel alloys by various researchers in different corrosive media [1]. The corrosion behavior of stainless steel was investigated in acidic chloride solution by creating single pit on type 304 stainless steel surface by masking specimens with photoresist except for a region of 100µm diameter and then exposing it to 1 N H₂SO₄ and 0.1 NaCl at 0.6 V [5].The impact of pH and chloride concentration on the pitting and crevice corrosion behavior of high alloy stainless steel was studied in super duplex and super austenitic steels [2]. Ningshen et al., 2010 studied the corrosion behavior of AISI type 304L stainless steel in different concentration of HNO₃ in presence of oxidizing ions at different temperatures [7]. Isaacs & Kissel, studied the pit propagation in stainless steels [3].

The purpose of this study is investigate the effect of hydrochloric acid (HCl) and ammonium chloride (NH₄Cl) on SS316, SS304, SS410, DSS2205 and CSA53. HCl with low pH is produced by hydrolysis in crude distillation column overhead and NH₄Cl in the platformer stabilizer over-head stream, where ammonia chloride deposits in the receiver (Stabilizer Accumulator V-8205) and causing under deposit NH₄Cl corrosion. The materials used in both streams in Mina Al Fahal Refinery are Carbon Steel.

2. METHODOLOGY
Traditionally, the evaluation of the corrosion rate in a metal is carried out by its weight loss measurement; this method consists in determining how much of the physical weight of metal is lost when immersed in a corrosive
solution after a certain period of time. On the other hand, and due to the evidently electrochemical nature of corrosion process, modern electrochemical method have been development to investigate metallic corrosion and consequently to measure pitting corrosion.

### 2.1 Weight Loss Method

Weight loss method was studied by following ASTM G48 Method. The metallic samples used in the experiments reported here are SS410, SS316, SS304, CSA53 and DSS2205 and the electrolytes used in the experiments are ammonium chloride with different concentration and pH. SS410, SS316 and SS304 samples were immersed in 1M NH\(_4\)Cl and pH of 5.16 at 37°C for 20 hours in water bath. The same procedures followed for the second experiment where the concentration of NH\(_4\)Cl was 6M and pH was reduced to 3.05 for a period of 144 hours (6 days) at 37°C. In the third experiment used 6M of the ammonia chloride and increases the time up to 144 hours (6 days) the stainless steel used in this experiment were SS304, SS410, SS316 and DSS2205 and temperature fixed to 37°C. For carbon steel A53 1M of the ammonia chloride with normal pH 5.16 was used and increase the time up to 96 hours (4 days) at 37°C. The second electrolyte used was HCl and SS410, SS316, SS316 and DSS2205 stainless steel samples were keep in water bath up to 48 hours at 37°C.

### 2.2 Electrochemical Test

A three-electrode cell was used for electrochemical measurements; the working electrode was the test material whereas the counter and reference electrodes were platinum and Ag/AgCl respectively. The electrolyte used was ammonium chloride with different pH values and hydrochloric acid.

#### 2.2.1 Design of Electrochemical Cell

The electrochemical cell (Figure 2.1) was designed in 3D using PRO ENGINEER Wildfire 4.0 Software. The Teflon was fabricated as per the drawing by using lathe machine. A suitable rubber O-ring of diameter 12mm and thickness of the rubber O-ring 2mm was selected. A hole of size 3 cm at the center of the beaker. The sample was fixed with the help of a bolt.

![Figure 2.1 Design of electrochemical cell](image)

#### 2.2.2 Test Procedure

600 ml of test solution is placed into the cell provided and place. The working electrode is placed into the rubber O-ring which is fixed on the Teflon surface. Solution was allowed to reach the working electrode through the Teflon cylinder. The reference and counter electrodes were inserted into the beaker. The red alligator clip from the potentiostat cable was connected to the counter electrode and the black to the working electrode and the black to the reference electrode. Double-clicked in General Purpose Electrochemical System software (GPES). The screen showed an X-Y graph of potential applied to the working electrode (V) against the current passed by the working electrode in μA.
3. RESULTS AND DISCUSSION

The results and discussion consists of the weight loss and the electrochemical tests that were performed to study the corrosion behavior of the selected samples.

3.1 Weight Loss Experiments

When the samples were exposed to 6M NH$_4$Cl the observed pH of the solution was found to be 7.58. Under these conditions corrosion was found only in SS316 and SS410 samples. More corrosion occurred in SS410. It was further observed that SS304 did not show any corrosion.

It was further found that carbon steel undergoes corrosion when exposed to 1M HN$_4$Cl solution for 96 hours at 37˚C at pH 5.16. For the tests performed on DSS2205 samples there was no corrosion at pH 3.05 in 1M NH$_4$Cl and pH 7.58 in 6M NH$_4$Cl. All the results reveal that DSS2205 and SS304 are the most resistive materials in the chosen environmental conditions. Fig 3.1 shows Scanning Electron Microscope (SEM) image of corroded surface of CS A53 in 1M NH$_4$Cl after 96 hours of exposure. The corrosion attack on the CS A53 sample illustrates that the steel undergoes some sort of general corrosion all over the exposed area with some small deep attacks as pitting. The EDS in Figure 3.2 shows the analysis of elements present on the surface and in the pits of CSA53. Iron and Oxygen are present in high percentage which is an indication of the Iron oxide (corrosion product) with some traces of Sulfur and Aluminum.

![Figure 3.1 SEM image of a corroded surface of the CSA53 after 96 hours immersion in 1M of NH$_4$Cl with some small pits.](image1)

![Figure 3.2 EDS for CSA53](image2)

Figure 3.3 shows the 3VHX-1000 Digital Microscope image of CSA53. The different colors on the image scale indicate the extent of corrosion that has taken place. It appears as a general corrosion.

![Figure 3.3 VHX-1000 Digital Microscope image of CSA53](image3)

Figure 3.4 is the Scanning Electron Microscope images for SS316 in 6M of NH$_4$Cl after 144 hours that show some stains in the grain boundaries and some element inside the pit which is not clear. It might be an un-attacked grain or inclusion or its part of corrosion product. Figure 3.5 shows corrosion pits on SS316 in 6M of NH4Cl after 144 hours for 10 µm. Elements of corrosion pit on Spectrum 23 shown in Figure 3.6 where the results showed that Iron...
element (Fe) has the maximum percentage while Silicon element (Si) has minimum percentage, which were 55.5% and 0.5% respectively.

Figure 3.7 shows the KEYENCE VHX-1000 Digital Microscopic images for SS316 in 6M of NH₄Cl after 144 hours. The image clearly shows the corroded area. Figure 3.8 is the SEM image of SS410 in 6M of NH₄Cl after 144 hours. Figure 3.9 shows the Digital Microscope image of SS410, after 144 hours immersion in 6M of NH₄Cl, two neighboring pits developed and shows a conical shape pit of the depth of 220 micron. Figure 3.10 is SEM image for SS410 in 0.0001M of HCl at pH 3.77 after 48 hours and reveals pits of variable diameters – 97.6 µm, 34.2 µm and 79.4 µm.

Figure 3.5 Corrosion pit on SS316 in 6M of NH₄Cl after 144 hours for 10 µm

Figure 3.6 Elements of corrosion pit on Spectrum 23

Figure 3.7 3D image of SS316 in 6M of NH₄Cl after 144 hours

Figure 3.8 SEM image of SS410 in 6M of NH₄Cl after 144 hours.

Figure 3.9 3D image of SS410 in 6M of NH₄Cl after 144 hours

Figure 3.10 SEM image of SS410 in 0.0001M of HCl after 48 hours.

Figure 3.11 shows image from KEYENCE VHX-1000 Digital Microscope for SS410 in 0.0001M of HCl at pH3.77 after 48 hours. The image clearly shows the corroded area.
3.2 Analysis of Electrochemical Tests

Anodic polarization scans (Figure 3.12) were performed at a scan rate of 10 m/s in 1 M and 6 M NH₄Cl solution on the selected samples. The test show that highest corrosion rate is observed in Carbon Steel in 1M of NH₄Cl and in SS410 in 6M of NH₄Cl. DSS2205 does not show any corrosion so it is the most resistant of all the samples.

Figure 3.11 3D image of SS410 in 0.0001M of HCl at pH3.77 after 48 hours

Figure 3.12 Anodic polarization for CS53, SS304, SS316, SS410 and DSS2205 in 1M of NH₄Cl and pH 5.16 at 37 °C

Figure 3.13 Anodic polarization for SS304, SS316, SS410 and DSS2205 in 6M of NH₄Cl and pH 7.58 at 37 °C
4. CONCLUSIONS

The discussion of various experimental results has shown that different effects may serve as stabilizing factors for localized corrosion. It depends on the stage of development of a corrosion pit and the environmental conditions which one is the most effective.

The following conclusions have been derived from the analysis of collected data.

1. Samples of SS410, SS304 and SS316 in 1 M of NH₄Cl and pH 5.16 after 20 hours in the weight loss test did not show any corrosion; however corrosion was found only in CSA53 when it was exposed to the same conditions for 96 hrs. The corrosion rate of the carbon steel was calculated to be 0.0327 mm/year.

2. Samples of SS410, SS304, SS316 and DSS2205 in 1 M of NH₄Cl and pH 3.05 after 20 hours also did not show any corrosion.

3. Sample of SS410, SS304, SS316 and DSS2205 in 6 M of NH₄Cl and pH 7.58 after 144 hours show the corrosion only in two samples namely, SS410 and SS316. The corrosion rate of SS410 was calculated to be 5.5947*10⁻³ mm/year and corrosion rate of SS316 was 3.8106*10⁻³ mm/year, but in SS304 and DSS2205 no corrosion was found.

4. Sample of SS410, SS304, SS316 and DSS2205 in 0.0001 M of HCl and pH 3.77 in the 48 hours did not show any corrosion except in SS410. However when the images were taken under the optical microscope some roughness on the surface was observed.

5. The anodic polarization tests conducted on the samples revealed in 1 M NH₄Cl highest corrosion rate occurred in CSA53 and DSS2205 did not show any corrosion.

6. When the samples were exposed to 1 M HCl at pH 3.77 all samples showed corrosion due to presence of aggressive chloride ions in the solution.

Finally it can be concluded that Carbon steel is not a good choice for the platformer and the crude distillation unit. SS304 and DSS2205 would be a good choice to manufacture the refinery equipment as they showed good resistance to the simulated refinery environment.

5. ACKNOWLEDGEMENT

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INTERNATIONAL BUSINESS TRANSFORMATION IN THE AGE OF MOBILE INNOVATION

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ABSTRACT
The paper briefly presents an overview on the ever changing style of doing business in the connected era. It shall discuss the multitude of issues, challenges, developments and contemporary business opportunities that organizations have in conducting business globally including the emerging trends and innovation in international business.

INTRODUCTION
Innovation is one of the fundamental factors that create the most impact in today’s global business environment. The transformations that the international business landscape is experiencing today are attributed to the emerging technological breakthroughs in terms of eliminating the gap between markets. The digital transformation of today’s global markets was signaled by the emergence of the megatrends such as mobile, cloud, big data, and social technologies. Although it was clearly established from previous studies that the technological megatrends are creating significant impact towards the transformation of international business, industry watchers are still skeptical about the number of adopters that are embracing the change to transform their business. According to the Harvard Business Review, the transformation of the international business landscape is occurring rapidly at a rate that no other major industry breakthrough had ever seen in decades (Ebrahim, 2013). Among the major technological megatrends today that is shifting the balance of power between international businesses is the mobile technology. When talking about mobile technology, it refers to the method of communication using cellular technology, which enables wide range coverage of wireless connectivity.

The absence of wired connection paved the way for the communication technology to evolve rapidly from exchanging calls and text messages into something more revolutionary such as data connection. The other megatrends mentioned earlier such as social media, cloud, and big data are just a few of the functionalities that were embedded into the mobile technology platform delivered by powerful mobile devices that houses almost every functions that are essential to international business operations. In this discussion, the impact of mobile innovation towards the transformation of international business will be explored by reviewing the findings from recent studies. Results from research surveys will be also used to determine the advantage and disadvantages of adopting mobile innovation in an international business environment. This includes identifying the risk factors attributed in data security and at the same, to determine the underlying growth opportunities in adopting mobile innovations in an international business. Furthermore, the discussion will also look at the historical transformations of some of the notable international businesses after a full integration of the mobile technologies into their various areas of operations. At the heart of this discussion is the establishment of the factors created by mobile innovations in transforming the international business. It is apparent that mobile innovation is taking a big role in global business by eliminating geographical constraints.

Transforming the way people and organization works
One way that mobile innovation impacts the transformation of the international business is the power to bring down the geographical barriers that creates the gap between markets. In a survey conducted by the Harvard Business Review in 2014, international business organizations that are engaged in transforming their businesses to align with the trends in mobile innovation are likely to have higher revenues and valuation as compared to competitors with lesser interest in mobile integration (Harvard Business Review Analytical Services, 2014). The survey was composed of 537 respondents from business research panels from the various regions of the globe such as North America, Europe, Middle East, Asia, and South America. One of the objectives of the survey is to determine how the Executives of multi-national organizations perceive the adoption of mobile innovation into their business operations and practices. Based on the results of the survey, the international business executives perceive the integration of mobile innovation as beneficial on three key areas of the business. These three areas were also regarded as essential areas of growth such as:

1. Accessing data from anywhere, anytime
2. Increase employee productivity without compromising operational cost
3. Increase collaboration
The manner of integration involved in transforming an international business to become mobile enabled includes equipping the members of organization with mobile devices such as tablets and smartphones to enable productivity regardless of time and location. In addition, companies are also developing mobile applications that consumers, partners, and suppliers can use to interact with the various areas of the business. In return, the adoption of the mobile innovation in the international business suggests a new approach in the internal IT infrastructure by enabling personally procured devices to be provisioned in the infrastructure in order to gain access to internal and external data for productivity while leveraging on the concept of anywhere access.

In another study where the impact of information and communication technology was measured on small and medium enterprises in emerging countries, it was determined that the productivity levels of employees and managers have increased dramatically with the effective integration of mobile innovation in the business processes (Bazhenova et al., 2012). The assumption was drawn from the results of the survey encompassing an increase in mobile Internet application utilization and other B2E application during the past five years.

Looking at these results, this could mean that the more enterprises integrate mobile innovations into their business processes, the more productive their employees and managers can become. However, there is still one more question that remains unclear, and that is how mobile innovation leads to the transformation of the international business environment.

First, it is important to look at the results of previously mentioned studies. In Bazhenova et al. (2012), it is apparent that mobile innovations enable more productive members of the organization. The measure of productiveness on the other hand was determined by the survey conducted by the Harvard Business Review Analytical Services (2014). Looking at the survey, it is apparent that having the capability to access information anytime and anywhere from mobile devices fostered increased productivity. The combination of the results of these two studies leads to an assumption that international business leaders and their organization are leveraging on mobile innovation to create their own transformation objectives. In this context, creativity and technology works hand in hand in enabling the transformation of the international business sector in unforeseen ways.

**Advantage and disadvantages of adopting mobile innovations**

One way to look at international business in terms of embracing the concept of mobile innovation to transform the organization is to determine both the upside and downsides of the technology itself and its implications. To describe the upsides of the mobile innovation in the context of international business setting, it is important to look at what
mobile innovation and international business is about. International business is rather vague in terms of giving an exact definition of what an international business is all about. Instead, international business can be described as a collection of enterprise activities initiated by private organizations in more than one location apart from the its local market. Now, combining the concept of international business with the mobile innovation encompasses a new approach in business processing. Taking into example is the business of natural resources export such as oil. The business itself resembles the characteristics of enterprise activities that transcends from one geographical location to another. The process involved in keeping track with the products, exported volume, profit, demand, and supply is a monumental task, which requires synchronized actions. However, one of the easiest ways to collaborate decisions in a geographically fragmented operation is to employ technologies that have the capability to go beyond the conventional communication methods such as the information communication technology or ICT enabled by mobile devices.

Figure 3 Example of mobile innovation enabled processes (ictinagriculture.org, 2012)

In the example diagram, mobile functions such as texting, call, and Internet makes up the components of the business processes from one end of the supply chain to the other. In between, the ICT enabled processes are able to deliver the end goal of the business, which also includes the necessary monitoring and data gathering measures that can be used for future decision-making. Although it looks that the mobile innovation is a promising approach in transforming the conventional international business practice into a more advanced set of practices. With the continuous surge of new developments in mobile technology, the introduction of smartphones that has the capabilities, capacity, and computing power comparable to that of a desktop computer, integrating functions for business processing paired with wireless Internet connectivity made it more possible for international businesses to take opportunities simultaneously in different regions of the global market. These remarkable qualities of the mobile innovations in changing the playing field of the global business was drawn from the upsides of having Internet as part of the mobile functionality (Fleischmann and Shrikantaiah, 2011).

The key characteristics of the combination of mobile and Internet is that smartphones and other mobile devices were considered as the top technological breakthroughs that has the capacity to produce a multitude of applications that can potentially transform a business. Secondly, mobile devices manufacturers are in constant move to develop and improve their platforms in order to accommodate more business and communication enabled apps. Lastly, more and more consumers are using mobile phones most particularly smartphones in engaging with companies be it buying products online or using the mobile phone for customer services. According to the recent statistics about the increase on the number of consumers using mobile phones, it shows that by 2016, about 2 billion people are smartphone users and is expected to increase by 7.6% in the next two years (eMarketer, 2014).
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Figure 4 Smartphone statistics (eMarketer, 2014)

This statistics represents a positive outlook for international companies in transforming their business to become ready for the surge of smartphone users in the coming years. In addition, this number of smartphone users also presents an opportunity for the international organizations in customizing their products and services in order to appeal to the global consumers who are at the same are smartphone users. However, despite the great potentials of the mobile innovation in turning the shift around for global companies towards global success, the technology also presents two critical disadvantages. One is that mobile communication and its communication platform depends on wireless data connectivity, which is prone to data security risks. Secondly, the security issues in the adoption of the technology for international organizations were attributed to the lack of control over the infrastructure that provides the mobile connectivity service for both the consumers and the organization (Donner and Escobar, 2009). Lastly, the available applications for smartphone users are not yet configured for a wide-scale consumer implementation and internal operational utilization. Therefore, the effective and successful adoption of mobile innovation in the international business environment depends upon the level of security and size of infrastructure that service providers have in order to address information security risks.

Integration of mobile innovation to the international business environment

Unlike the local based business models, the international business is much more dynamic and the ability of the organization to cope up with the challenges of globalization is the key to future success and growth. One example of an international business that had experienced immense growth globally partly with the help of mobile innovation is Amazon. In an article by Reuter (2015), the company’s growth rate currently stands at 27.2% for the online marketplace while the auction growth rate have increased by 21.8% surpassing the 16.2% mark set by eBay. The growth of Amazon’s business was owed from online sales of its merchandise, which the comprising market is composed of mobile device users ranging from tablets to smartphones (Soreng, 2015). Another important international business that made a huge impact towards the social economic sector is Google, which is the developer of the Android platform, which a majority of smartphones today are using today. The growth of the Google as a leading technology company was partly owned from mobile users as the surge of youtube and other social media contents were introduced to the consumer market. The company’s revenue from its video streaming website service was drawn from a significantly large number of advertisements placed on featured videos on Youtube. The paid clicks from mobile devices generated by the company have reached a modest 24% from the last quarter of 2014 (Marvin, 2014). From another industry’s perspective such as Ericsson, the growing influence of mobile innovation in transforming an enterprise is a result of creative integration of the technology implemented on a global scale. Ericsson is among the recipients of the Mobile Innovations award in 2014 for their successful implementation of the M2M technology using today’s mobile phones (themobileinnovationsawards.com, 2015). MIT also published a list of 50 smart companies that are exploring the possibilities of growth through mobile innovations and one of them is Tesla Motors. The company is primarily engaged in automotive battery manufacturing industry, but it didn’t stop them from integrating mobile functionalities in their products and services. The way Tesla Motors was able to transform its multi-national enterprise is to put together innovative ideas into their car batteries so that the product’s purpose can be extended from cars to residential homes (MIT, 2015). Mobile innovation was successfully integrated into the business by allowing the mobile platform to become a part of the CRM system that takes the management role of the key areas of the business operations a lot easier. The series of changes in the aforementioned international
businesses can be regarded as creative in the sense that the nature of the products and services was never a factor that may prevent the successful integration of mobile innovations into the various areas of the business operations. For instance, manufacturing car batteries is not related to smartphones, but the company rather utilized the capabilities of the mobile technology in order to streamline the operational integrity of the business including the relevant processes involved.

CONCLUSION

There are several ways that the international business can leverage on the opportunities that mobile innovation can offer in order to successfully transform the industry. One of the emerging patterns from the adoption of mobile technology is to augment the products and services to generate data for growth related decision-making. It is apparent that international business encompasses fragmented characteristics, which makes it difficult for its central operations unit to keep track of all the activities that are happening within the organization both onshore and offshore. However, the ability of information communication technology embedded in today’s generation of mobile devices to bring connect anytime and anywhere, international firms is likely to take advantage of exploring new market regions. Furthermore, the technological preferences of consumers are changing constantly with the trend; among the fast-paced trends in technology are the innovations in mobile devices, which pose a potential for a more effective organizational communication approach. However, transformation of an international business still depends on its leadership perspective and creative vision through innovation.

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CONSUMER PERCEPTION TOWARDS DIGITAL MARKETING STRATEGIES IN OMAN

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ABSTRACT

Human consumption has moved a long way from being a standard process through which customer needs are satisfied, to a dynamic process that evolves continuously. With the emphasis on marketing orientation becoming a norm among the business circles, organizations are spending a great deal of time and resources to attract customers’ attention towards their products and retain them with their organization. This has resulted in advertisements becoming more creative day by day and thus exerting a great deal of influence on their prospective customers.

Organizational success in today’s competitive business environment depends greatly on the success of promotional and brand building strategies. This necessitates the organizations to find new and innovative methods to reach maximum number of customers and customise their product offerings wherever possible, to suit the customer needs. Though other marketing activities also help organizations to achieve their marketing goals, digital marketing has provided the effectiveness and flexibility required for achieving both these objectives successfully as they allow organization to communicate with a large number of people in a very short time at almost zero cost compared to paper based campaigns. Digital marketing greatly reduces the reliance of marketers on one directional modes such as print, radio and television advertising. With the advent of different forms of this new marketing technique (such as mobile telephones, internet and other forms of interactive communication) marketers are now able to enter into a meaningful two way dialogue with their customers. Digital marketing techniques have enabled organizations to track consumer interests and obtain an inexpensive direct link to the customer. This immediacy and accessibility, when combined to matrices, analysis and customer profiling/segmentation, would make the digital world even more attractive and effective to business organizations. Digital marketing has opened up a world of opportunities to aspiring businesses. However, certain areas regarding the usage of this technology need further investigation. With the amount of spam mails and unwanted short messages received from certain organizations that are not socially responsible, many customers have developed a negative view on digital marketing and advertising. Partial and imperfect information, flawed and baseless promises, doctored customer experience notes and false winning notifications given by the organizations through online advertisements have also made the customers less accommodative towards digital advertising. Digital marketing, though a relatively new technology, is used successfully by certain organizations in Oman. But the growth of this technology in Oman could be greatly influenced by cultural sensitivities, literacy rate and the limited access to internet among the populace. The perception towards digital marketing strategies varies greatly among the general public, forcing the organizations to wonder whether the returns would be worth the effort. No formal scientific research has been conducted to date to understand consumer actions with regard to digital marketing in Oman. A research of this nature would help the organizations to understand the barriers and tailor their digital marketing strategies to overcome them successfully. As such, this paper makes an effort to investigate the perception of Omani consumers towards digital marketing strategies. 250 consumers who have already got exposed to digital marketing strategies will be used as the sample for this research. The data collected will be analysed using SPSS software and interpreted to obtain useful insights.

1. INTRODUCTION

Human consumption has moved a long way from being a standard process through which customer needs are satisfied, to a dynamic process that evolves continuously. With the emphasis on marketing orientation becoming a norm among the business circles, organizations are spending a great deal of time and resources to attract customers’ attention towards their products and retain them with their organization. This has resulted in advertisements becoming more creative day by day and thus exerting a great deal of influence on their prospective customers.

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organizations to communicate with a large number of people in a very short time at almost zero cost compared to other forms of campaigns.

Digital marketing greatly reduces the reliance of marketers on one directional modes such as print, radio and television advertising. With the advent of new communication techniques (such as mobile telephones, internet and other forms of interactive communication) marketers are now able to enter into a meaningful two way dialogue with their customers. Digital marketing techniques have enabled organizations to track consumer interests and obtain an inexpensive direct link to the customer. This immediacy and accessibility, when combined to matrices, analysis and customer profiling /segmentation, would make the digital world even more attractive and effective to business organizations. Digital marketing has opened up a world of opportunities to aspiring businesses. However, certain areas regarding the usage of this technology need further investigation. With the amount of spam mails and unwanted short messages received from organizations that are not socially responsible, many customers have developed a negative view on digital marketing and advertising. Partial and imperfect information, flawed and baseless promises, doctored customer experience notes and false winning notifications given by the organizations through online advertisements have also made the customers less accommodative towards digital advertising.

Digital marketing, though a relatively new technology, is used successfully by certain organizations in Oman. But the growth of this technology in Oman could be greatly influenced by cultural sensitivities, literacy rate and the limited access to internet among the populace. The perception towards digital marketing strategies varies greatly among the general public, forcing the organizations to wonder whether the returns would be worth the effort.

No formal scientific research has been conducted to date to understand consumer actions with regard to digital marketing in Oman. A research of this nature would help the organizations to understand the barriers and tailor their digital marketing strategies to overcome them successfully. As such, this paper makes an effort to investigate the perception of Omani consumers towards digital marketing strategies and their impact on the purchase behaviour.

2. LITERATURE REVIEW

Perception is the process through which individuals develop a logical perspective of the issues which happen around them. This “world view” changes among individuals, as what they perceive about a given situation could be very much different from person to person. It is about how individuals select, organize and interpret stimuli, so that they can understand their world (Fill, C. 2011).

As De Chernatony (1999) explained, individuals on average are exposed to around 550 advertisements each day. Apart from these commercial advertisements, the individuals may also be exposed to much higher number of non-commercial stimuli. In order to manage this information overload, the human sensory system filter them and select only those stimuli that has managed to capture the attention of the individuals (Solomon, 2014).

The stimuli thus selected are then organized, so that they could be interpreted to make meaning. The meanings are generated by the individuals through the use of existing categories (Cohen, Basu, 1987). Categorization is actually a fundamental sense making activity that encompasses all forms of stimulus situation (Arnould et al, 2008). This helps individuals to decide how their behavior need to be in a given situation. Factors such as the past experience of the individual, knowledge about the product or brand etc. could play a major role in deciding those existing categories (expectations). The meanings thus generated help form individual perceptions.

Perception is an important factor in product selection and evaluation (Javalgi et al, 1992). When products are standardized to a greater extent, the individuals will be forced to make their decisions based on factors other than the physical characteristics. This is where the perception of the individual may come into play. (Fill, C, 2011). Today, marketing has become a leading medium for the organizations to affect or manage perceptions. This is so, as effective perception management is of paramount importance to develop a win-win situation to both customers and organizations (Smith, 1994). Effective perception management requires advertisements to be tailored to satisfy / suit customer needs (Kotler et al, 2010). Internet and world wide web along with other digital technologies (such as email marketing, mobile marketing, digital billboards, social media marketing), have provided a great opportunity for the entire business sector to achieve this goal (Pilotta, and Schultz, 2005).

Digital marketing is considered to be very useful and effective as it provides an opportunity to measure or trace customers’ perceived value towards a brand ( Madhavaram et al, 2005). This also helps organizations in achieving their ultimate objective of continuous recruitment of new customers while retaining the old ones (Dewhirst and Davis, 2005). This requires the organizations to manage the communication content and frequency effectively (Godfrey et al, 2009). Hence, while concentrating on the promotional content, organizations should also focus on the relational content as well (Merisavo et al, 2006). This focus may help the organizations to position themselves to exploit the digital technology to improve their business practices. The new business model which uses technology as its backbone, has dramatically changed the organizations’ approach towards attracting new and temporary customers (Baines et al, 2009). This business model has made customer engagement as a crucial factor for
organizational success (Carter and Parameswaran, 2012). But the excessive focus on customer engagement has resulted in other, more important issues as well.

One of the biggest concerns of digital marketing techniques, is the invasion of privacy. It is difficult to define privacy as the concept and its boundaries could be perceived differently by different individuals (Adams, 1999). As per the privacy model developed by Adams (1999), individuals who use technology for communication, consider three aspects with regard to privacy.

- Sensitivity of the information
- The receiver
- How the information is going to be used.

The combination of these three factors help the individuals to form a perception about invasion of privacy (Adams, 2000). The excessive focus on sales, by the organizations, seems to have backfired on this privacy equation. As such, this business model has been looked at suspiciously by a growing number of individuals. As per the October 2001 report released by Forrester Research, more than 60% of online users were not happy about providing their personal information online. This may have cost nearly $15 billion in 2001 (Kelly, Denton and Broadbend, 2001) to the entire business sector around the world. Unni and Harmon (2007) conducted another study to understand the perceived value of the cost of trading the personal information as a result of digital advertisement techniques. The participants chosen for this study were all undergraduate students, from an American University. The results showed that participants had more negative perceptions towards push types advertisements while the negativity was reduced to moderate to low for pull type of advertisements, which is delivered only upon receiving explicit requests.

One of the more recent survey conducted (by Turow et al, 2009) among 1000 adult American consumer showed that consumers were willing to reject online and tailored advertisements due to serious privacy concerns. More than 50% of the participants were of the opinion that they do not want to receive any kinds of digital advertisements either through email or by other means. A scenario based research carried out by Motorola Applied Research Centre, which targeted the participants who are between 18-45 years of age, also identified similar privacy and credibility related concerns from the participants (Zhang et al, 2010). In contrast, a survey conducted by Barwise and Strong (in 2002) among 1000 young adults (16-30 years) in London showed slightly different picture where 69% of the participants perceived the digital marketing technique as ‘satisfactory’. It is clear that studies conducted in this area thus far has produced mixed results. As lead generation and conversion play major roles in digital marketing, organizations who focus on this need to know the customer concerns and take them seriously. This requires meaningful segmentation and effective targeting. Meaningful segmentation and effective targeting, requires accurate market intelligence on need and perception. As perception influences consumer behaviour, understanding individual perception related to digital marketing strategies can be very much useful in the organization’s marketing effort. Though researches have been conducted in the field of digital marketing, very rarely the focus has moved towards Middle East region. To this date, there is hardly any research is done in this area clearly focussed on Oman. This research makes and effort to fill this void.

3. RESEARCH OBJECTIVES AND METHODOLOGY

Research objective
To investigate the perception of Omani consumers towards digital marketing strategies and their impact on the purchase behaviour

Nature of the Sample
The sample consists of educated individuals of different ages who are quite used to electronic gadgets and use them in their day to day life. These individuals are also more adopted toward the modern lifestyle and preferences.

Research Instrument
A structured questionnaire was issued to each of these individuals to record their responses. Due care was taken to avoid or reduce any possible biases

Sample Size
The sample size was restricted to 250. Accordingly, 250 respondents were selected among the target population and questionnaire were issued to all these respondents. Out of 250 only 238 respondent’s data were found to be valid and fit for the purpose.
Analysis
The response recorded by the individuals were analysed using SPSS 20 and interpreted to get useful insights about the phenomenon.

4. RESEARCH FINDINGS
Out of the responses chosen for interpretation, 75% of them were lesser than 50 years age. 62% of them were males and 38% were females. All the participants were educated up to High School level or above, and nearly 74% of them were full time employees of either public or private sector organizations. 66% of the participants were Omani nationals while the balance 34% were expatriates living in Oman. All of these respondents have been exposed to some form of digital marketing during the past one year, at least once.

Based on a detailed literature review the researcher identified 19 variables to have certain level of influence towards consumer perception. As a first step, the SPSS was used to check for any inter correlations. As there wasn’t any significant inter-correlations, KMO and Bartlett’s Test was carried out to understand the suitability of the sample for factor analysis.

<table>
<thead>
<tr>
<th>KMO and Bartlett’s Test</th>
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<tbody>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling</td>
<td>.613</td>
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<tr>
<td>Adequacy</td>
<td></td>
</tr>
<tr>
<td>Bartlett’s Test of</td>
<td>Approx. Chi-Square 2351.441</td>
</tr>
<tr>
<td>Sphericity</td>
<td>df 171</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
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</table>

KMO and Bartlett’s Test showed the sampling adequacy of 0.613. As the value was greater than 0.6, it was decided by the researcher that factor analysis will be suitable for this analysis. The test result was significant as well.

As a standard practice, towards dimension reduction, Varimax rotation along with Kaiser normalization (which focus on retaining the factors with eigenvalues greater than 1) was used to analyze the information. The researcher also decided to consider the variables which has a minimum factor loading of 0.5 in the rotated component matrix, for the analysis. This enabled the researcher to extract 5 Principal Components.

As 83% of the total variance is accounted for by these 5 Principal components (which is more than the generally accepted total variance of 70%), it was decided by the researcher that the components identified are credible enough for further analysis. The scree plot also supported this decision.

<table>
<thead>
<tr>
<th>Total Variance Explained</th>
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<tbody>
<tr>
<td>Compon Initial Eigenvalues</td>
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<td>10</td>
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</tbody>
</table>
Principal Components

The first principal component correlates strongly with lack of trust worthiness (0.857), product being different from the one that is advertised (0.852) and wasting the time of the individual (0.843). The component also intensely correlates with three of the other original variables, such as privacy concerns (0.807), irritating promotions (0.787) and pop-up-ad disturbances. This suggests that these six criteria would increase (vary) together. As these variables are mostly focused on trustworthiness of the product and infringement of privacy, the component is classified as Trust and Privacy concerns.

The second principal component correlates strongly with four of the original variables while a slightly weak correlation was observed with two more variables. The component increases strongly with their belief on social media advertising (0.917), belief about customization (0.909), digital advertisement as the best way to attract customers (0.883) and online ads considered as a guide for purchase (0.771). The component also varies with customers being motivated (0.607) and credibility of promotions (0.596), but, at a lesser degree. As the four main variables are focused on targeting individual needs through customized adverts, the component is classified as Perceived Usefulness.

The third variable varies strongly with the belief on unnecessary mails being sent (0.875) and flowed promises (0.806). The component also increases with two other variables, decreasing usefulness of information and decreasing proof of quality (-0.572). As all these variables are connected to consumer’s perception on the promotional tactics, the component is classified as flawed promises and unfit messages.

The fourth component varies strongly with value for money (0.866) and to a lesser degree with increase in sales (0.651). As sales can be a result of value for money perception, the component is classified as Concern on Value for money.

The fifth component increases with only one variable, convincing promotions, (0.863). Hence, the component is classified as Ability to Convince. Once the Principal components are identified, linear regression technique was used to identify the rate of influence, held by the identified principal components on the purchase decisions. For this purpose the principal components such as, Trust and Privacy concerns (x1), Perceived Usefulness (x2), Flowed promises and unfit messages (x3), Concern on value for money (x4) and Ability to Convince (x5), were used as the independent variables, while decision towards purchase is used as the dependent variable.

Since multiple regression is applied, adjusted $R^2$ becomes predominant statistic. It is evident from the results that the adjusted $R^2$ for model is 0.882, suggesting that the independent variables could have 88.2% influence on the purchase decisions of the individuals. Apart from higher explanatory power, the applied model was also significant through a F statistic of 152.477 with p-values of 0.000.

Since, purchase decision is modelled by the researcher as, $P.D = \beta_1 + \beta_2 x_1 + \beta_3 x_2 + \beta_4 x_3 + \beta_5 x_4 + \beta_6 x_5 + \varepsilon$

The ascertained values are,

$P.D = 0.261 - 0.214 x_1 + 0.714 x_2 - 0.398 x_3 + 0.012 x_4 + 0.215 x_5 + \varepsilon$

This may be interpreted as,

1. $x_1$, $x_2$ and $x_4$ are asserting positive influence, though $x_4$, from the ‘t’ statistic and the associated p-value reflects insignificance. However, if the sample size is increased, the insignificance may turn significant

2. Independent variables $x_3$ & $x_5$ have a negative influence on the Purchase decision and they are significant as well.
3. \( \beta I \) which is constant is not predominant in this model with a value of 0.361, which is insignificant at 95% confidence limit. This suggest that the purchase decision will be heavily dependent on the independent variables \( x_1 \), \( x_2 \) \( x_3 \), and \( x_5 \).

5. CONCLUSION AND POLICY IMPLICATIONS

The first principal component, namely Trust and Privacy concerns, have accounted for nearly 41% of the total variance. This shows that the trust and privacy concern has been one of the main concerns of the individuals involved in the survey.

The second principal component, which focuses on the respondents idea on the perceived usefulness of digital marketing techniques, accounted for about 16% of the total variance, while the third, fourth and fifth principal components, that focuses on the customer’s concern on promotional tactics, concern on value for money and perception on the digital marketing techniques’ ability to convince people, accounted for 11%, 9% and 6% of the total variance respectively.

As the percentage of variance suggests, one of the main concerns for the respondents has been the untrustworthy nature of digital marketing along with the invasion of privacy. This dominant perception needs to be taken very seriously by the professionals while deciding on their communication mix to promote their products. Respondent were also of the view that digital marketing campaigns provide flawed promises and send unfit messages to the customers. This is also a serious issue, as this perception may force the consumers to revert to different technologies which could ultimately block access particular consumer accounts. This concern could distance even the genuine customers away from the organizations.

On the positive side of the spectrum, respondents were of the view that digital marketing campaigns provide customised advertisements. Consumers feel that it is very useful as advertisements customised based on previous knowledge help the customers to solve some of their problems. Consumers also feel that digital marketing campaigns, and online advertisement in particular, have a greater ability to convince the customers. Hence, it is of paramount importance, that advertising agencies gather useful and accurate information about the customers and their requirements, and customise the advertisements accordingly. This requires better information gathering system that should not be intrusive, but effective enough to gather required intelligence.

The multiple regression analysis explained that Trust and privacy concerns has a strong negative correlation with decision making. As such, unless the negative perception with regard to trust and privacy is tackled effectively, it may have serious impact on the purchase decisions. Perceived usefulness of digital advertisement was identified to have positive influence on purchase decisions. Similarly convincing ability of digital advertisements also exerting positive influence on the purchase decisions. These two factors together can have significant impact on the digital marketing decisions. This requires organizations to gather useful marketing intelligence to develop advertisements that could convince the receivers in terms of perceived usefulness.

Flawed promises and unfit messages exert negative influence on purchase decisions. This is another area which needs to be taken care of. Marketing strategists in the organizations need to be more focused on this, as any increase in this factor could create more distrust towards the brand. This negative word of mouth could have a destructive influence on branding and market share.

Through this study, the researcher has managed to identify the perception of Omani consumers towards Digital Marketing strategies, and the kind of influence they could have on the purchase decision. This information could be of paramount importance for number of organizations who either practice Digital Marketing strategies, of aspire to practice the technique in future.

REFERENCES


TUNNEL FIELD EFFECT TRANSISTOR (TFET) MODELING AND
DEVICE SIMULATION USING SYNOPSYS TCAD TOOLS

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ABSTRACT
This paper presents a simulation based study of tunnel field effect transistor (TFET) using commercially available
technology computer aided design (TCAD) device simulator. Double gate TFET devices employing Germanium
source with 25nm gate length are simulated. A step by step procedure to simulate the device is presented and the
electrical characteristics are extracted from the device simulation. A look up table based model using Verilog-A is
used to verify the inverter circuit performance.

Keywords: TCAD, Band to band tunneling, device simulation, TFET, Subthreshold Swing.

1. INTRODUCTION
TCAD is a computer aided design tool used in semiconductor industry for device design, fabrication process,
technology characterization, yield optimization etc [1]. It plays an important role in providing insights into designing
of nanoscale and emerging devices like TFETs and their performance that cannot be obtained from simple analytical
models or experimentation [2]. Complementary metal oxide semiconductor (CMOS) devices are continuously
scaled as per the Moore’s law [3] and the reduction in size has led to a mark improvements in switching speed,
higher packing density etc. This scaling in advanced CMOS technology results in higher power consumption due to
off state leakage and degradation of ION/IOFF ratio [4]. Current conduction in conventional MOSFETs are based on
drift and diffusion mode of transport and the subthreshold swing (SS) is limited by Boltzmann distribution of carriers
to as low as 60mV/decade. There is a need to explore new devices that use other mode of carrier transport,
at a supply voltages of less than 0.5V together with lower subthreshold swing (<60mV/decade) that maintain high on
current with reduced off state current and that compete directly with their CMOS counterparts in terms of power,
area and speed[5]. The other modes of carrier transport and device architectures with steeper SS include impact
ionization[6-7], interband tunnelling transistors[8], ferroelectric FET[9] , carbon nano tube transistor [10] etc. Here
we investigate the potential of TFET as it can be operated well under 0.5 V with steeper SS and does not have delays
associated with other modes of transport mechanism. Moreover, they have reduced temperature sensitivity and
variability of its electrical characteristics with the change in conditions [4]. However, the devices based on tunneling
mechanism failed to meet ITRS standards [11] as it has low ON current. Lots of literature is available on TFET
device performance. [12] shows how to boost up the ON current of tunnel FETs by incorporating double gate and
utilizing the high k dielectrics like HfO2 and ZrO2. To further enhance the ON current, Germanium material [13] is
employed. [14] showed that TFETs can be scaled down in nanometric range and still do not suffer from short channel
effects like MOS devices and its subthreshold slope in not limited to 60mV/decade barrier by utilizing high k
dielectrics.

2. TUNNEL FET DEVICE LEVEL CONSIDERATIONS
2.1 DEVICE STRUCTURE AND OPERATION
The tunnel FET is a gated p-i-n device structure that is fully compatible with MOS technology. The device structure
is shown in Figure 1 and as explained in the introduction, it utilises double gate structure together with Germanium
source to boost the ON current. The regions in the tunnel FETs have been named as source, channel and drain
respectively in order to be consistent with current MOS technology. The n(p) type device is turned OFF when the
gate is held at 0V and turned ON when the positive(negative) voltage is applied to the gate. Source to drain junction
is reversed biased in n(p) type device. The current conduction in TFET is Band to Band Tunneling (BTBT). In n(p)
TFET, electrons(holes) tunnel from source valence(conduction) band to drain conduction(valence) band.

2.2 DEVICE PARAMETERS, MODELING AND SIMULATION
The tunnel FETs investigated here are double gate structures and utilise Germanium as source material and are
simulated using Synopsys Sentaurus TCAD version G-2012.06 [15]. Non local tunneling Kane’s model [16]
available in Sentaurus TCAD is used. Doping in n and p type TFETs are optimized in order to keep the high ION/IOFF
ratios.
In order to suppress the ambipolar effect [17], it is desirable to have high source doping as compared to drain doping. Table 1 shows the nominal parameters for the device structure. The doping levels for n(p) type TFET were chosen to be $1 \times 10^{20} (5 \times 10^{20}), 1 \times 10^{17}$ and $5 \times 10^{18} (5 \times 10^{19})$ atoms/cm$^3$ for source, intrinsic channel and drain respectively.

The design flow of the modeling of TFET is shown in figure 2[15]. It all starts with drawing planar structure of device using device structure editor SDE available in sentaurus TCAD. The structure is drawn according to the parameters listed in table 1. During device drawing a script file is automatically generated which can be saved and can be easily edited for future reference drawings. When structure of device is saved, _msh.tdr file is generated by sentaurus editor. The structure of the devices (NFET and TFET) showing grid and doping information are shown in figures 3-4. _msh.tdr together parameter file (_des.par) act as an input to the sentaurus device. It is a numeric semiconductor device simulator capable of simulating the electrical, optical and thermal characteristics of various semiconductor devices. A typical command file of Sentaurus Device consists of several command sections (or statement blocks), with each section executing a relatively independent function. The default extension of the command file is _des.cmd.

Sentaurus Device produces several output files:

- A file containing electrode names and resulting voltages, currents, charges, times, temperatures, and so on, whose name is indicated in the Current statement
- A file with the spatially distributed solution variables and their derivatives, whose name is indicated in the Plot statement
- A protocol file whose name is indicated in the Output statement

Figure 5 shows the electrical characteristics that are obtained as output from Sentaurus Device. The drain current verses gate voltage of both n and p type tunnel FETs are plotted for a drain voltage of 0.4V and can be viewed on Inspect tool. Similarly the variation of capacitances with gate voltage can also be plotted for a drain voltage of 0V and 0.4V respectively.

| TABLE I. Nominal Parameters of the device structure |
|---------------------------------|-----------------|
| Gate Length, $L_G$ | 25nm |
| Oxide thickness, $T_{OX}$ | 1nm |
| Gate dielectric constant | $21 (HfO_2)$ |
| Body thickness, $T_{Si}$ | 6nm |
| Gate overlap | 2nm |
| Source/Drain Doping, $N_{SD}$ | $1 \times 10^{20} \text{cm}^{-3} / 5 \times 10^{18} \text{cm}^{-3} \text{(N-type)}$
| | $5 \times 10^{20} \text{cm}^{-3} / 5 \times 10^{19} \text{cm}^{-3} \text{(P-Type)}$
| Channel Doping, $N_{CH}$ | $10^{17} \text{cm}^{-3} \text{(P-Type)}$ |
| Gate work-function | 4.15 eV (N-type)
| | 5.05 eV (P-Type) |
TFET is an emerging device and therefore no accurate SPICE model is available. Very few analytical models are available in literature [18-19] and many are underway. [18] shows the lack of the drain control over channel current. [19] fails to give accurate results at higher gate voltages. Here, we have used a look up table based model using Verilog-A models obtained from Penn State University, NDCL [20] for circuit simulation.
Schematic of the Verilog-A transistor model is shown in Figure 8. It is a lookup table-based model composed of two-dimensional tables: the transfer characteristics $I_d$ ($V_{ds}$, $V_{gs}$), the gate-source capacitance $C_{gs}$ ($V_{gs}$, $V_{ds}$) and the gate-drain capacitance $C_{gd}$ ($V_{gs}$, $V_{ds}$) across a range of fine-step drain-source voltage bias $V_{ds}$ and gate-source voltage bias $V_{gs}$. The parasitic series resistance and parasitic external capacitance are not included in the TCAD model, which can be added at the circuit level. Due to the ongoing efforts of p-type Tunnel FET development, we assume almost identical drive-currents for the n-channel and p-channel transistors in TFET Verilog-A models for the optimal circuit performance. This lookup table based model is very efficient and precise method of modeling upcoming devices whose SPICE models are not available yet[21].

4. **Tunnel FET Based Inverter**

Circuit schematic of TFET based inverter is shown in figure 7. In order to test the functionality of the table driven Verilog-A model of the TFET devices, various characteristics of inverter are plotted in figures 8-11. DC transfer characteristics are plotted in figure 8. It shows an excellent response at the output in correspondence to a given DC input. Figures 9-10 show the transient characteristics corresponding to a pulse and sinusoidal input. As seen from figure 9, we get undershoot or overshoots. This is due to the larger Miller feedthrough capacitance originating from its fundamental device operation coupled with its low drive current as compared to the MOSFETs[22]. Total Miller capacitance comes from the gate-to-drain capacitance ($C_{gd}$) of both the n- and p-type transistors and this fundamental cause of increased effective capacitance in TFETs is due to higher and dominating gate-to-drain capacitance in TFETs.

Figure 11 shows the AC response of the inverter having a gain of almost 10 and higher cut off frequency. The higher gain and higher cut off frequency of TFET based inverter is observed owing to higher $g_m/I_d$ ratios at lower supply voltages [23].

5. **Conclusion**

Technology Computer-Aided Design (TCAD) is the numeric computer simulations to develop and optimize semiconductor processing technologies and devices. As technologies become more complex, the semiconductor industry relies increasingly more on TCAD to cut costs and speed up the research and development process. In this study, Synopsys TCAD tools are utilized for modelling and device simulation of TFETs. The simulation results showed the 2-D structure of TFETs from device simulation and the extraction of the electrical characteristics of the TFET devices which is further used to simulate the circuit level performance of the TFET based inverter using Verilog-A table driven model. The performance characteristics of inverter circuit indicate that the table driven or lookup table based model is very efficient and precise method of modeling upcoming devices like TFETs.
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Figure 8. DC Response

Figure 9. Transient Response for pulse input

Figure 10. Transient Response for sinusoidal input

Figure 11. AC Response

REFERENCES


DESIGN, FABRICATION AND TESTING OF INDIRECT TYPE
NATURAL CONVECTION SOLAR DRYER

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Ishaq R. Al-Hatemi4, Ekhlas A. Osman5

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ABSTRACT
This research is an attempt to develop an indirect natural convection solar dryer for crop. The aim is to produce a
drying crop with good quality and decrease the drying time. Five different indirect type natural convection solar
dryer concepts design were presented. One design concept was chosen after screening process which consists of a
solar collector, a drying chamber, and chimney. The thermal performance of the final design of solar dryer was
studied. Several experiments were performed at Sohar city in Al Batina North governorate of Sultanate of Oman.
The effects of chimney cross section area, weather conditions and storage media on the thermal performance of
solar dryer were studied. The results showed that, the higher performance of solar dryer with storage media
and chimney area of 10*10 cm². The results recorded the average outlet collector temperature is 46.5°C compared
with average ambient temperature is 32 °C. Furthermore the results showed that the experimental and theoretical
dryer efficiency of solar collector are 13.1% and 17.6%, respectively. The results summarized that solar dryer
showed a good performance in drying time and high quality of the product compared with open sun drying.

Keywords: Solar energy, date Palm, Indirect solar drying, Natural convection, Dryer efficiency

1. INTRODUCTION
Solar energy a form of sustainable energy has a great potential for wide variety of applications because it
is abundant and accessible, especially for countries located in the tropical reign. The characteristics of weather in
Oman are very hot and that is helps to use solar drying method. The average solar radiation in Sohar is 5
kWh/m²/day and the daily sunshine duration of sun shine hours is between 8.0 and 10.5 h [1]. The daily average
of ambient temperature is 32°C. Solar drying can be considered a better alternative for natural and food products
with no harmful effect to environment, cost effectiveness and elimination or reduction of fossil fuel use [2]. Dried
dates are becoming highly alternative to marketing than the freshly harvested products and most of the dates are
still dried by traditional method of open air natural sun drying. Dates are the principal crop in the sultanate of
Oman and accounted for 80% of all fruit area across the country in 2012, according to Oman’s Ministry of
Agriculture and Fisheries MAF [3]. Solar drying is a good suggestion to drying the date in Oman to get a good
quality product. Many experimental studies reported the various methods used for drying of agricultural materials
using solar dryer [4-5]. Musteyan et al. [6] presented a study on the design, performance, and application of various
types of solar dryers available today. The types examined are the direct, indirect, mixed-mode, active, and passive
solar dryers. Experiments are performed with indirect solar dryer with forced convection to dry tomato crop [7].
They concluded that increase of drying air temperature and the reduction of the thickness of the slices make
decrease in drying time. In addition, the effect of air velocity is less in comparison with drying air temperature.
Leberl et al. [8] investigated the effect of drying conditions (air temperature, humidity and air velocity) on drying
of mint, and they concluded that, the drying air temperature is the main factor in controlling the rate of drying. The
performance of an indirect forced convection solar dryer integrated with heat storage material is designed,
fabricated and investigated for chili drying [9]. The results showed that the dryer with heat storage material enables
to maintain consistent air temperature inside the dryer and the inclusion of heat storage material also increases the
drying time by about 4 hrs per day. A comparison study between the direct and indirect solar dryer was performed
for mango drying [10]. They concluded that the indirect solar dryer is suitable for industrial or semi industrial
mango drying, whereas direct solar dryer was appropriate to a family scale traditional mango drying. A natural
convection indirect solar dryer with backup burner for small scale pepper berry farmers was design and
implemented [11]. The additional biomass solar dryer allowed the continuous drying process at nights and
during wet seasons. It shortened the drying duration of pepper berries from 5-7 days to a single day with
continuous drying. It increased the productivity small scale rural pepper farmers as they could produce the dried
pepper berries in a shorter period of time. El-Sebai et al. [12] designed and tested an indirect type of natural
convectional dryer that uses an absorber plate. They recorded the solar radiation, distribution of temperature in
various parts of the drying system, and relative humidity. They found that drying time is eminently decreased by
the storage and chemical pretreatment of drying crops. Hegde et al. (2015) [13] Design an indirect, active-type,
environmentally friendly; low-cost solar dryer is designed to dry various agricultural products. They found that Banana dried at 1 m/s air flow rate is of the best quality in terms of color, taste and shape when compared to drying at 0.5 and 2 m/s air flow rate.

This research is an attempt to develop indirect type natural convection solar dryer for crop. The aim is to produce a drying dates with good quality and decrease the drying time. Five different indirect type natural convection solar dryer concepts design were presented. One design concept was chosen after screening process which consists of a solar collector, a drying chamber, and chimney.

2. DESIGN PROCESS

Indirect solar dryer concept is adopted in the proposed design. Five design concepts were generated. Natural and forced convection heat transfer techniques are considered in dryer design. The basic parts of the design concepts are solar collector, drying chamber, and chimney. The design specifications and constrains are shown in Table 1.

Table 1 Design specifications and constrains.

<table>
<thead>
<tr>
<th>Items</th>
<th>Constrains and Assumptions</th>
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<tbody>
<tr>
<td>Location</td>
<td>Sohar city (latitude 24° and longitude 56°)</td>
</tr>
<tr>
<td>Crop</td>
<td>Banana</td>
</tr>
<tr>
<td>Initial moisture content</td>
<td>85%</td>
</tr>
<tr>
<td>Final Moisture content</td>
<td>15%</td>
</tr>
<tr>
<td>Collector tilt angle</td>
<td>27 degree</td>
</tr>
<tr>
<td>Drying period</td>
<td>April- May</td>
</tr>
<tr>
<td>Drying per batch</td>
<td>1 kg/batch</td>
</tr>
<tr>
<td>Ambient air temperature average</td>
<td>32 °C</td>
</tr>
<tr>
<td>Ambient relative humidity</td>
<td>72.6%</td>
</tr>
<tr>
<td>Drying time</td>
<td>9:00 to 18.00 h</td>
</tr>
<tr>
<td>Incident solar radiation</td>
<td>5.197 kWh/m²/day</td>
</tr>
</tbody>
</table>

2.1 Concepts Generation

Five different indirect type natural convection solar dryer concepts design are presented in this section. The following is a simple sketch and explanation of each concept.

**Concept 1**
First concept is solar dryer with naturally convection. The main components of the concept are chamber connected with collector. The collector is absorbed the sun light and convert it to the thermal energy and by air movement carrying the thermal energy to the chamber and make drying. Air movement here is naturally. This design has no any mechanical device.

**Concept 2**
Second concept is generating solar dryer also with natural convection. The main components of the concept are chamber connected with collector and storage media which set it inside collector. The collector is absorbed the heat from storage media and convert it to the thermal energy and by air movement carrying the thermal energy to the chamber and make drying. Air movement here is naturally. This design has no any mechanical device.
Saad A. Mutasher et al.

Concept 3
Third concept is generate solar dryer with forced convection. The main components of the concept are chamber and collector with two fans at the top of chamber. The collector is absorbed the sun light and convert it to the thermal energy and by air movement carrying the thermal energy to the chamber and make drying. The new thing here is fans. The main

Concept 4
Forth concept is generate solar dryer also with natural convection. The main components of the concept are chamber with chimney and collector. The collector is absorbed the sun light and convert it to the thermal energy and by air movement carrying the thermal energy to the chamber and make drying. But in this concept chimney was added and which was connected to the top of the chamber. To decrease the drying rate.

Concept 5
Fifth concept is generating solar dryer with forced convection. The main components of the concept are chamber with chimney connected with fans at the top and collector. The collector is absorbed the sun light and convert it to the thermal energy and by air movement carrying the thermal energy to the chamber and make drying. The adding of fans and chimney to increase the air flow that going out from the chamber to improve the drying rate.

2.2 Screening Process
Screening criteria’s were developed to select the best design to develop. Each concept scored relative to ‘Reference Concept’ which is concept 1. According to Table 2 better than is (+), same as is (0), and worse than is (-). As a results concept 4 is ranked higher and chosen as a concept design to develop. Figure 1 shows the dimensions of final design and the fabricated prototype of solar dryer.

3. EXPERIMENTAL SETUP
The system was test with load and without load from 21st of April 2015 to 5th May 2015 at location in College of applies Sciences - Sohar which has latitude 24 degree and longitude 57 degree. Three digits weight scale (ADAM, PGW453e) was used to measure the decreasing of the weight of drying material. Five thermocouples
type K were installed to measure the temperature at the collector inlet, collector outlet, drying chamber outlet, chimney outlet and the ambient temperature. Thermocouple data logger LASCAR EL – USB -1 was used to collect the temperatures data. The air flow velocity throughout the collector was measured by Thermal Anemometer- Extech SDL 350.

<table>
<thead>
<tr>
<th>Selection criteria</th>
<th>Concept 1 (Reference)</th>
<th>Concept 2</th>
<th>Concept 3</th>
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<td>1</td>
<td>3</td>
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</table>

Table 2 Screening process

Figure 1 final design dimension and physical prototype of solar dryer

4. RESULTS AND DISCUSSION

4.1 The Effect of Chimney Exit Size

Two different tests were conducted in order to study the effect of chimney outlet cross-section area on collector outlet temperature variation. The first test was unloaded dryer with 10*10 cm² chimney outlet cross section area and the second was 10*20 cm² chimney outlet cross section area. Temperature data were registered at an interval of 5 min. Drying test was started at 9:00 h and stopped at 18:00 h (during April 21-22, 2015). Figure 2 shows the difference between the outlet collector temperatures in chimney with outlet of 10*10 cm² and chimney with outlet of 10*20 cm². The maximum temperature recorded at chimney with outlet of 10*10 cm² was 51.5°C with average temperature of 45.5 °C. For the chimney with outlet of 10*20 cm², the maximum temperature
recorded is 46.5°C with average temperature of 40.1°C as shown in Figure 2. The results leads to understand that the performance of the solar drying system improve in case of using chimney with 10*10 cm² outlet cross section area. The area reduction reduces the air mass flow rate, and then the chance of heat accumulation is higher.

4.2 Dryer Thermal Performance

Indirect solar dryer performance was tested with chimney cross section of 10 x 10 cm². Temperature data were registered at an interval of 5 min. Drying test was started at 9:00 h and stopped at 18:00 h (during April 23, 2015). The test was conducted with variation of temperature at three different positions which are in collector inlet, collector outlet, chamber outlet and the ambient temperature during same period of time. The temperature profile inside the dryer depends on various parameters such as solar radiation, ambient temperature, relative humidity and wind speed. The average air flow velocity throughout the collector was measured and it is recorded as 0.626 m/s. It was observed that, when the wind velocity was more or less uniform throughout the day, the air velocity in the collector shows definite dependence on the stack temperature difference between ambient and collector outlet air. Figure 3 showed the temperature variation in collector inlet, collector outlet, chamber outlet and chimney outlet. The maximum air temperatures were recorded in those four positions are 46°C, 53.5°C, 54.5°C and 52°C respectively. 40°C maximum ambient temperature has been recorded.

![Figure 2: Variation of collector outlet temperatures with 10*10 cm² and 20*10 cm² chimney outlet cross section areas during April 21-22, 2015.](image1)

![Figure 3: Variation of temperatures at collector inlet, collector outlet, chamber outlet and chimney outlet during April 23, 2015](image2)

4.3 The Effect of Weather Conditions on Dryer Thermal Performance

Experiments were carried out at three continues days which are 23, 24, 25 April 2015, to observe the performance of solar dry at different weather conditions. The experiments were considered with cross section area of chimney 10 *10 cm². The result showed that the maximum temperature of outlet collector for 23, 24, 25, are 52 °C, 56 °C, and 60 °C respectively as shown in Figure 4. The results summarized that, the outlet collector temperature is not stable day by day. It is keep in fluctuating and depends on air speed and ambient temperature of the site.
4.4 Dryer Thermal Performance with Heat storage Media

Using of thermal storage media will accelerate the drying process, the storage media will absorb the heat during day time and it will start to release that heat after day time, which is leads to decreasing of drying time. Figure 5 presents the effect of heat storage media on the collector outlet temperature in the indirect solar dryer. Oman’s rocks was used as heat storage media which is brought from Wadi Hibi in Sohar area as shown in Figure 1. The test carried out continually for thirteen hours for the period of day time and night time till 9:10 pm. Temperatures measurements were conducted with variation of temperature in collector outlet during the same period of time. The maximum collector outlet temperature and the ambient temperature were recorded for the system without using storage media and are 51°C, 40°C respectively as shown in Figure 5. On the other hand the maximum collector outlet temperature for the dryer with heat storage media is 52°C at about the noon as shown in Figure 5, then the temperature fall progressively towards evening but that reduction of temperatures are remain lower compared to without using storage media. This is concluded that rises of temperature at the end of the period of time will accelerate the drying process.

4.5 Solar Dryer Test with Banana Fruit

4.5.1 Weight with time

To test the dryer, 1 kg of banana fruit was choppy into 5 mm thickness and separated on three trays equally. The drying process was carried out into two procedures. First Open Sun drying and using Solar Dryer. The experiment was run for 21.5 hrs until the moisture content reached to steady state. Figure 6 shows weight reduction of the product with time for open sun and solar dryer it is clear that solar dryer improve the drying process.
4.5.2 Moisture Content with Time

Figure 7 shows the decreasing of moisture content in both solar dryer and open sun samples with the time. It's seen that the moisture content of solar dryer samples decreases faster compared with the open sun sample. Also the solar dryer sample reached the 15% moisture of content before three hours than open sun sample.

![Figure 6: weight with time](image1)

![Figure 7: Moisture content with time](image2)

4.5.3 Drying Rate with Time

Figure 8 shows the decreasing of drying rate in both solar dryer and open sun samples with time. It's seen that the drying rate of solar dryer sample was more than the open sun sample. The average drying rate of solar dryer and open sun samples are 41.3 and 35.6 g/s respectively. Figure 9 and 10 shows the final product, before and after drying. It obvious that the dried product using solar dryer is in a good quality compared to open sun drying.

![Figure 8: Drying rate with time](image3)

(a) Before

(b) After

![Figure 9: Solar Dryer sample](image4)
4.6 Compression between Theoretical and Experimental

Table 3 shows comparisons between experimental and theoretical results of drying rate and collector efficiency. The theoretically calculations showed that 1kg of banana fruit needs around 17.7 hrs to reach to 15% moisture content, whereas, it takes 18.5 hrs experimentally to reach to 15% moisture content. In addition the results compared with open sun drying and showed drying time around 21.5 hrs to reach to 15%. The drying rate of solar dryer and open sun dryer are 41.3 g/hr and 35.6 g/hr respectively. Good agreement was found between theoretical and experimental results.

Table 3: Comparisons between theoretical and experimental results.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Drying time, (hrs)</td>
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<td>21.5</td>
<td>17.7</td>
<td>30</td>
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<td>Collector efficiency</td>
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<td>17.6%</td>
<td>14.3</td>
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<td>Drying rate for 1 kg</td>
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<td>35.6 g/hr</td>
<td>43.2 g/hr</td>
<td>51.0 g/hr for 2 kg</td>
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5. CONCLUSIONS

In this paper five design concepts were proposed for indirect solar dryer. Design criteria’s were set to choose the best concept to develop. The final design consist three basic components which are solar collector, dryer chamber, and the chimney. The test and evaluation was done for the prototype. Four different experiments were carried out to obtain the maximum average temperature of collector outlet. The result showed that the chimney with 10*10 cm² and 20*10 cm² gave average temperature around 46.5 °C and 40.1°C respectively. In addition, solar dryer with storage media (oman’s rock) was tested and the results showed the average temperature was 46°C. The storage media release the heat in the night and keep the chamber temperature 2.5°C higher than the ambient temperature. Banana has initial moisture content 80% and final moisture 15 %. The theoretically calculations showed that 1kg of banana fruit needs around 17.7 hrs to reach to 15% moisture content, whereas, it takes 18.5 hrs experimentally to reach to 15% moisture content. In addition the results compared with open sun drying and showed drying time around 21.5 hrs to reach to 15%. The drying rate of solar dryer and open sun dryer are 41.3 g/hr and 35.6 g/hr respectively. The result summarized that solar dryer showed a good performance in drying time and high quality of the product compared with open sun dry.

6. ACKNOWLEDGEMENTS

The authors would like to thank College of Applied Sciences – Sohar for financial support of this research. Gratitude is also expressed to the Department of Engineering.

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STUDY OF CORROSION INHIBITION IN SS316, SS304 AND SS410

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ABSTRACT

Even though stainless steels are considered to be very versatile materials having high resistance to corrosive environments, still they suffer from pitting corrosion in certain environments. The use of inhibitors has been quite effective in controlling corrosion of metals. There is a continuous search for better corrosion inhibitors to meet the need of the industrial expectations. In the present study corrosion protection of some samples of stainless steels namely SS304, SS316 and SS410 has been analyzed by means of three different corrosion inhibitors. Electrochemical and Weight loss methods were adopted and the experiments were carried out at a constant temperature of 37°C in FeCl₃ and NH₄Cl. The addition of inhibitors in different concentrations affect the pitting corrosion of SS304, SS316 and SS410. The outcomes of both the methods reveal that an increase of inhibitor concentration results a decrease in the pitting corrosion in all the samples. However the best protection efficiency and least corrosion rate has been observed when samples were injected with inhibitor A.

Keywords: Pitting corrosion, Inhibitors, Stainless steel, Weight loss method and Electrochemical test.

1. INTRODUCTION

Due to industrialization and environment issues the problem of corrosion has been increasing day by day. In areas and surroundings where chloride ions are found, localized corrosion for instance pitting or crevice is a severe problem for stainless steels. The corrosion behavior of the material depends on the environment to which it is subjected. Stainless Steels are excessively used as major construction materials in most of the industries [2]. Even though it is considered to be resistant to corrosion still it suffers from corrosion in certain environment. Use of inhibitors to protect metals from corrosion is considered to be one of the most convenient methods [4]. A huge amount of research has been done to study the influence of various organic compounds used as inhibitors on the corrosion of steel.

The inhibition effects of Silybum marianum extract for corrosion of SS304 in 1.0 M HCl solution was studied. At the highest extract concentration of 1.0 g/L, the inhibition efficiency was increased markedly and reached 96%. The inhibition action was executed via adsorption of the extract ingredients on 304 SS surface [5].

The efficiency of inhibition increases when the concentration of inhibitor is increased [6]. The effectiveness of Dimethyl-4, 40-dipyridinium di-iodide (DPy) and TPy, as inhibitors for the corrosion of type 430 SS in aerated sulfuric acid solution was investigated and it was revealed that the compounds worked as mixed type inhibitors and enhanced the passivation of the SS, and their inhibition efficiencies increased with inhibitor concentration and temperature [1]. Polarization curves have been used for investigating the corrosion of steel in 0.5 M of sulphuric and 1.0 M of hydrochloric acid. The results illustrated that the inhibitor efficiency increased as the concentration of the solution increase as well as the adsorption of the inhibitor on the exterior surface follows Langmuir adsorption isotherm [6]. The increased concentration of vanadium and manganese in the steel specimen illustrates increased corrosion resistance [3].

2. METHODOLOGY, DESIGN AND EXPERIMENTATION

2.1 Materials: Corrosion study was carried on samples of different grades of stainless steel namely SS316, SS304, and SS410.

2.2 Solutions: This test was carried in FeCl₃ and NH₄Cl medium (100 grams of FeCl₃ in 900 ml of distilled water and 53.5 g NH₄Cl in 1 liter distilled water).

2.3 Methods: Weight loss method and Electrochemical Corrosion Tests were performed to assess the inhibition efficiency of the selected inhibitors.

2.3.1 Weight loss method

Pitting corrosion test (ASTM G48 Method – A) was employed as a weight loss method.100 grams of FeCl₃ were dissolved in 900 ml of distilled water. This gave an approx. 6% FeCl₃ solution. The solution was then filtered to remove insoluble particles.
2.3.1.1 Specimen preparation
The sizes and configurations of specimens in a test series should have the same dimensions. The specimen surfaces were cleaned with ethanol and air dried.

2.3.1.2 Procedure
500 ml of FeCl$_3$ solution was poured into the test vessel. The container was transferred to the constant-temperature bath and the bath controller was set to the required temperature. The specimen was set in a glass cradle and immersed in the test solution. The container was covered with a watch glass and the bath temperature was maintained within the required limits (37°C). After 20 hours sample was taken out from the solution. The specimens were removed, rinsed with water and lightly scrubbed with a nylon bristle brush to remove corrosion products. Finally the sample was cleaned with acetone or methanol and air dried. The final weight of the sample was recorded on the worksheet.

2.3.1.4 Evaluation
The samples were checked with a steel pin or scriber to ascertain if pitting has occurred and the microscopic images of the samples were taken.

2.3.2 Electrochemical corrosion test
The test cell used in the corrosion measurement by electrochemical method is shown in Figure 1. It consists of three electrodes, viz., working, reference and counter electrode. Reference electrode helps in establishing a stable potential. Counter electrode made of Platinum is used to supply the current flowing through the working electrode during the test. The metal specimen itself generally works as working electrode. The cell also contains the solution in which the specimen is to be tested.

![Figure 1. Experimental setup](image)

3. RESULTS AND DISCUSSION
The weight loss method of determining corrosion rate and inhibition efficiency is beneficial because it is easy to use, its results are reliable and overall it is a cost effective technique.

3.1 Weight Loss Experiments (without inhibitor)
Figure 2 presents the results of corrosion effect in 3.6 M FeCl$_3$ before and after the weight loss test. After 20 hours the samples of SS304, SS316 and SS410 were taken out and the images were taken under VHX-1000 digital microscope.

The microscopic images for each sample are also shown in Figure 2. It can be observed that strong pitting corrosion has happened in SS304 and SS316 samples. While in SS410 micro-pits were observed all over the surface that gave an impression of general corrosion.
<table>
<thead>
<tr>
<th>Steel</th>
<th>Before the Test</th>
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<th>Microscope Images</th>
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<tr>
<td>SS304</td>
<td>![Image]</td>
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<tr>
<td>SS316</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
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<tr>
<td>SS410</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
</tbody>
</table>

Figure 2. Samples showing corrosion effect in 3.6 M FeCl₃ before and after the weight loss test.

### 3.2 Weight Loss Experiments with Corrosion Inhibitor-A Filming Amine EC1021A.

The corrosion inhibition increases as the concentration of inhibitor goes high. This is due to the fact that the adsorption amount and coverage of inhibitor on stainless steel surface increase with an increase in inhibitor concentration. It is to be observed that at inhibitor concentration around 1200 ppm, the corrosion rate reaches certain value and does not show significant change.

At a particular inhibitor concentration, the weight loss in SS304 is comparatively higher than that in SS410 and SS316. Figure 3 shows that Inhibitor- A is a good quality inhibitor for SS in FeCl₃ solution. Under the same conditions, the inhibition efficiency was studied by weight loss method for SS316 and SS410.

On comparing the inhibition performance of Inhibitor-A for different steels it can be observed that Inhibitor-A shows better inhibition performance in SS304 and SS316 than SS410 in the FeCl₃ media. Finally, as an overall observation it is concluded the addition of Corrosion Inhibitor-A reduces the corrosion rate in all types of stainless steels. It is to be noted from Figures 3, 4 and 5 to that the weight loss and hence corrosion rate in all three samples decreases with the increase in the concentration of Inhibitor.
3.3 Weight Loss Experiments with Corrosion Inhibitor B – EC1385A

![Graph showing weight loss versus concentration of Corrosion Inhibitor B](image)

Figure 4. Weight loss versus Corrosion Inhibitor – B in 3.6 M FeCl₃ Solution.

3.4 Weight Loss Experiments with Corrosion Inhibitor C – SR 1200

![Graph showing weight loss versus concentration of Corrosion Inhibitor C](image)

Figure 5. Weight loss versus concentration of Corrosion Inhibitor-C

3.5 Electrochemical Corrosion test

Corrosion basically is a process that involves electrochemical oxidation and reduction reactions, therefore, electrochemical methods can be employed to determine corrosion rate and the behaviour of the corroding systems. When a metal is placed in a solution, electrochemical reactions start occurring at its surface, causing it to corrode. These reactions produce an electrochemical potential, commonly known as corrosion or open circuit potential, at the metal-solution interface.

3.5.1 Effect of concentration of inhibitor-A on SS304 in 1M NH₄Cl

![Graph showing potentiodynamic curves of SS304 anode in 1M NH₄Cl](image)

Figure 6. Potentiodynamic curves of SS304 anode in 1M NH₄Cl for varying concentration of Inhibitor-A
It can be seen in Figure 6 that the break point Voltage (V) for SS304 without corrosion inhibitor was 0.5 V but the break point voltage (V) for same material with inhibitor at 1200 ppm concentration is 0.65 V. This means that the inhibition effect comes from the reduced value of the reaction area on the surface of the corroding metal. The high inhibitor concentration is generally related to the charge transfer of the corrosion process. Anodic polarization with little more positive potential than the primary passive potential were carried out in 1.0 NH₄Cl at 37°C with and without the presence of inhibitor concentrations (400 ppm, 800 ppm, 1200 ppm) of the inhibitor-A. It was observed that the break point voltage increased upon increasing the concentration of inhibitor. It was found to be maximum for 1200 ppm. Figure 6 shows the change of corrosion rate with Inhibitor-A concentration. It is clear that an increase in Inhibitor-A concentration causes an increase in the pitting potential, i.e., decreases the pitting corrosion.

3.5.2 Effect of concentration of inhibitor-A on SS316 in 1M NH₄Cl

Figure 7 shows the relation between Current and Voltage for SS316 in 1M NH₄Cl for different values of Inhibitor-A concentrations. It is noted from Figure 7 that up to 800 ppm concentration there is no significant change in corrosion potential, however, a high change in corrosion potential is observed at 1200ppm. Additionally, the inhibition efficiencies obtained from weight loss method and electrochemical polarization curves are almost identical. The shape of the curve is same in all tests, indicates that almost no change in the corrosion mechanism occurs due to the addition of Inhibitor-A in SS316.

3.5.3 Effect of concentration of inhibitor- A on SS410 in 1M NH₄Cl

Figure 8 show the variation of current with voltage for SS410 in NH₄Cl without and with Inhibitor-A at different concentration.

The Voltage in the presence of inhibitor is larger than that in the absence of inhibitor and increases as the inhibitor concentration increases. This indicates that the increase voltage in SS410 depends on increase in the corrosion inhibitor-A concentration. The corrosion rate decreases with the increasing of Inhibitor-A concentration, i.e., retards the corrosion of SS410 in 1.0 M NH₄Cl. This result confirms that the Inhibitor-A is an anodic inhibitor. The increase
in inhibitor concentration from 400 ppm to 1200 ppm decreases the corrosion rate due to adsorption of inhibitor molecules on the surface of the sample.

3.5.4 Effect of concentration of inhibitor-B on SS304 in 1M NH₄Cl

Figure 9 shows the relation between current and voltage for SS304 in NH₄Cl with Inhibitor-B at different concentrations. The curves clearly show that as the concentration of Inhibitor-B is increased the breakpoint potential of the sample also increases. Polarization curves for different concentrations are almost parallel to that of obtained for blank solution. Inhibitor B shows good efficiency in decreasing the corrosion rates in different concentrations of the inhibitor.

3.5.5 Effect of concentration of inhibitor- B on SS316 in 1M NH₄Cl

Figure 10 shows the relation between current and voltage for SS316 in NH₄Cl without and with Inhibitor-B at different concentration. The inhibitor efficiency increases as the concentration of the inhibitor goes high.

3.5.6 Effect of concentration of inhibitor- B on SS410 in 1M NH₄Cl

Figure 11 show the relation between current and voltage for SS410 in NH₄Cl with Inhibitor-B at different concentration. It can be observed from the figure that maximum inhibitor concentration shows the best inhibition efficiency.
3.5.7 Effect of concentration of inhibitor-C on SS304 in 1M NH₄Cl

Figure 12 also shows that all the curves are almost parallel to each other. Thus, the addition of inhibitor does not have any significant impact on the mechanism of SS304 with inhibitor-C. However, as the concentration is increasing the inhibition efficiency is also increasing.

3.5.8 Effect of concentration of inhibitor-C on SS316 in 1M NH₄Cl

Figure 13 shows the relation between current and voltage for SS316 in NH₄Cl with Inhibitor-C at different concentration and without inhibitor. It is again observed that the increase in concentration of inhibitor shows an increase corrosion inhibition.

3.5.9 Effect of concentration of inhibitor-C on SS410 in 1M NH₄Cl

Figure 14 shows the relation between current and voltage for SS410 in NH₄Cl with Inhibitor-C at different concentration and without the inhibitor. The addition of inhibitor does not show any remarkable change in the corrosion rate. So inhibitor C cannot be regarded as a good inhibitor for SS410 in 1M NH₄Cl.
4. CONCLUSION

Corrosion inhibition has been studied by using stainless steel in our desired samples in FeCl₃ and NH₄Cl as our medium with various inhibitors at constant temperature of 37°C. The results obtained by electrochemical methods are identical as those obtained by weight loss methods. Without the inhibitor all samples got corroded. SS304 and SS316 showed strong pitting corrosion in FeCl₃ while SS410 showed development of micro pits that gave an impression of general corrosion. All the inhibitors were efficient in decreasing the corrosion rate of the samples under study. However, (Filming Amine) EC1021A inhibitor was the most effective in decreasing the corrosion rate for SS304, SS316 and SS410 in both FeCl₃ and NH₄Cl solution. The inhibition efficiency of inhibitor A, B and C increases with the increase in inhibitor concentration. However, the increased concentration of inhibitor results in an increased breakdown potential towards the positive direction, i.e., that indicates pitting corrosion. The corrosion inhibitor formed a layer over the surface of the samples, which stops the aggressive anions to reach to the surface of samples thus preventing corrosion to happen.

5. ACKNOWLEDGEMENT

I take this opportunity to express my profound gratitude to Mr. Ahmed Jawad from EXOVA Company and Dr. Ashraf Al Hinai from Sultan Qaboos University for their guidance and continuous support during this project.

REFERENCES

SEASONAL VARIATIONS OF MINOR IONS ALONG THE COASTLINE OF OMAN

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ABSTRACT

Increasing water demand both in the domestic and the industrial sectors has made seawater desalination as a promising alternative source of water in the coastal areas of many countries. Several handy technologies are available for desalination but reverse osmosis (RO) due its simple operation, less installation and maintenance cost has come into sight as a cost-effective technique.

As the performance of an RO membrane is highly dependent on the concentration of ions in the feed water, this study was made to investigate the variations in concentration of minor ions present in seawater along the coastline of Oman for the winter and summer seasons.

The results showed that the presence of barium, sulphide, selenium, arsenic, and free chlorine is very less. Silicate was found in low concentration at all locations with some variation at few places during summer. Fluoride concentration at all locations was low in both the seasons. Boron levels at all locations were high in both seasons. Summer values for Strontium exhibited large variation with the average while winter values did not vary much.

Keywords: Seawater Composition, Minor Ions, Reverse Osmosis, Membrane Performance, Desalination.

1. INTRODUCTION

Due to unavailability of adequate fresh water resources and increased water demand, nowadays seawater desalination has become an important process [2]. For desalination of sea and brackish waters, a number of technologies such as multi stage flash, multi effect distillation, vapor compression and reverse osmosis (RO) have been adopted in many countries across the world [1,8]. Each technology has its own advantages and limitations. RO technology based plants offers the advantages of less installation cost and capital expenditure, economical operation, easy to start, and less maintenance, etc. [4]. In order to establish an RO technology based desalination plant at any desired location, composition of raw feed water is one of the essential requirements for its optimal design as it plays an important role in the performance of RO membranes [8]. The relationship between the concentration and membrane performance helps the plant operators to get high recovery within the system design limits. The minor or trace contaminants have both environmental as well as health impacts and so it becomes essential to remove the trace elements to meet the World Health Organization (WHO) specifications for drinking water quality.

The present study has been performed to analyze the concentrations of minor ions in seawater at ten locations along the Oman coastline. The aim of the research was to provide a database to be used for deciding the optimized conditions to operate an RO desalination plant.

2. METHODOLOGY

Sultanate of Oman is located in south west Asia between latitudes 16° N and 28° N and longitudes 52° E and 60° E. Its coastline is stretched over 2092 kilometers between the Arabian Sea on the southeast and Gulf of Oman on the northeast. Ten important locations, based on the future water requirement for various sectors, viz., Shinas, Sohar, Suwaiq, Barka, Seeb, Muttrah, Qurriyat, Sur, Duqm and Salalah were identified for data collection. Seawater samples were collected at a depth of 5 m (approximately) between November-December in winter season and between July-August in summer season. Standard sample preservation methods were employed to preserve the samples [1,13,14].

3. RESULTS AND DISCUSSION

The results found for winter and summer seasons are presented in Table 1 and Table 2 respectively. Ions having concentration of the order of 1 mg/L are considered to be trace constituents. Barium, silicate, fluoride, boron, sulphide, hydrogen sulphide, ammonium sulphide, strontium, selenium, arsenic, chlorine consumption and free chlorine were analyzed as minor or trace ions [12]. It is to be noted from Table 1 and Table 2 that
concentration of barium, ammonium sulphide, selenium, arsenic, and free chlorine was not significant. The results of silicate, fluoride, boron, sulfide, hydrogen sulfide and strontium are discussed in the following subsections.

<table>
<thead>
<tr>
<th>Parameter (mg/L)</th>
<th>Shinas</th>
<th>Sohar</th>
<th>Suwaiq</th>
<th>Barka</th>
<th>Seeb</th>
<th>Muttrah</th>
<th>Qurriyat</th>
<th>Sur</th>
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<th>Salalah</th>
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</table>

3.1 Silicate

Presence of silicate may cause erosion of pipes during the seawater flow and is also responsible for scale formation and silica fouling in RO membranes thus blocking the membrane pores that leads to low water recovery and damage of the membrane as well [11]. According to a study done by Bremere and his co-authors, silica concentration in bulk can reach three to four times the concentration of silica in the feed water [6]. As most of the silicate settles to the bottom of the ocean, its concentration was found to be very low at nearly all the locations. However, it can be seen from Figure 1 that at Suwaiyk, Duqm and Salalah the concentration is higher than rest of the locations during summer due to the phenomenon of upwelling during which small but measurable quantities of silica may be detected. But, this concentration will not precipitate in any stage of the plant as according to Permasep manual [9] scaling might occur above a level of 160 mg/L.
3.2 Fluoride

The maximum acceptable level of fluoride in drinking water according to WHO Standards is 1.5 mg/L [3]. Figure 2 shows the values of fluoride during the two seasons. In winter it was found to be in the range of 1.3-1.5 mg/L while it varies from 1.27 to 1.49 mg/L during the summer. The concentration of fluoride was found to be already low and in acceptable limits at all locations. It will reduce further upon rejection by the membrane [7].

3.3 Boron

According to Mance [5], boron is one of the most significant constituent of seawater with an average known concentration of 4.5 mg/L [10]. At pH ≤ 7 boron is present in the form of boric acid, B(OH)₃. Due to small size and lack of charge, it is rejected up to 50-90% depending on the membrane type. At pH > 10 boron is present as borate ion B(OH)₄⁻ which is characterized by large radius and negative charge, hence, is rejected well up to 99% by the RO membrane. According to the standard established by WHO, the specified value of boron in drinking water is 2.4 mg/L. It can be observed in Figure 3 that boron levels at all locations are more than the specified value and so needs to be rejected by the RO membrane to acceptable level. However, low or nearly same concentration of boron during summer as compared to winter is a noticeable observation.

3.4 Strontium

The values of Strontium during winter and summer were found to be in range of 6-10 mg/L at all locations. It is to be noted from Figure 4 that the variation during winter is less compared to summer. Seeb had maximum value during summer (10 mg/L).
4. CONCLUSION

In this paper seasonal effect of minor ions present in the seawater at ten different locations has been analyzed and discussed. The information about minor ions present in the seawater will be helpful for the current and future developments and operations of desalination plants at the respective locations. No significant values were achieved for Barium, Sulphide, Hydrogen Sulphide, Ammonium Sulphide, Selenium, Arsenic, Chlorine consumption and Free Chlorine.

5. ACKNOWLEDGEMENTS

Authors are thankful to Oil and Water Analysis Lab of Petroleum Development Oman for permitting to perform the experimental work.

REFERENCES

SEASONAL VARIATIONS OF MAJOR IONS ALONG THE COASTLINE OF OMAN

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ABSTRACT

The seawater composition is constant but may regionally vary due to various factors like location and temperature. This study was conducted to provide data about the seasonal seawater compositional variations to the desalination community particularly for Reverse Osmosis Technology. Variations in the composition of major ions present in the seawater have been investigated along the coastline of Oman for the winter and summer seasons. Sampling depth was 5 m. The major ions like Calcium, Magnesium, Sodium, Chloride, Potassium, Carbonate, Bicarbonate, Bromide, and Sulfate showed almost constant composition except few locations.

Keywords: Seawater Composition, Major Ions, Reverse Osmosis, Coastline of Oman

1. INTRODUCTION

Middle East countries are experiencing a substantial increase in water demands both in the domestic and industrial sectors [1,3]. Several desalination plants have been constructed and many more are going to come up for the production of potable water. A number of desalination technologies have been developed for desalination of sea and brackish waters. The most commonly used commercial technologies are Multi Stage Flash (MSF), Multi Effect Distillation (MED), Vapor Compression (VC) and Reverse Osmosis (RO) for seawater desalination. The RO plants are much easier to start up, maintain, economical to install and operate than their distillation counterparts. In order to setup a desalination plant at any location, composition of raw feed water is required for optimal design of the plant. The concentration of Major ions plays a vital role in the performance of RO membrane [7]. Realizing the importance of the composition of raw feed water, Middle East Desalination Research Centre (MEDRC) sponsored a project to develop a seawater composition database. The seasonal effect of major ions gave information for the current and future developments and operations of desalination plants at the respective locations.

2. METHODOLOGY

Oman is located in south west Asia on the south east coast of the Arabian Peninsula. It lies between latitudes 16° N and 28° N and longitudes 52° E and 60° E. The country has a long coastline of 2092 kilometers formed by the Arabian Sea on the south east and Gulf of Oman on the northeast.

Seawater samples were collected at selected ten locations in Oman over a period of two months during the winter (Nov-Dec, 2008) and summer (July-Aug, 2009) seasons. The locations were decided keeping in view the existing and future demands for potable water at these places. The sample collection locations from North to South along the coastline are shown in the map in Figure 1. The seawater samples were collected with the help of local fishermen by travelling on the fishing boats into the sea at a depth of 5 m (approximately). A fabricated sampler consisting of a glass bottle with a cork attached to a pre-calibrated rope was used for this purpose.

As chemical and biological changes are inevitable when the sample is removed from the parent source, standard sample preservation methods were followed to preserve the samples immediately.
upon collection [13,15]. The samples were stored in cold flasks with and without the addition of 10ml Nitric acid.

3. RESULTS AND DISCUSSION

All ions whose concentration is found to be more than 1 ppm are considered to be major ions as they contribute significantly to the salinity of seawater.

3.1 Major Ions

Pi-chart shown in Figure 2 shows the major ions by weight and percentage present in the seawater.

![Figure 2. Relative concentrations of ions (average) in seawater by weight](image)

It is to be noted from Figure 2 that the chloride ion which makes 55% is the main component of the major ion present in the seawater. Sodium is the next main ion which makes 31%. The two comprises a total of 86%. The next two significant ions, sulphate and magnesium comprise 8% and 4% of the weight of seawater ions, respectively. Calcium, magnesium, silica, sulphate, barium and iron are the major scaling ions [2,11]. Calcium carbonate, calcium sulphate, strontium sulphate, calcium phosphate, calcium fluoride and reactive silica are the common inorganic scalants found on a fouled RO membrane [2]. Calcium and magnesium ions increase the hardness of water. Magnesium salts are highly soluble and typically does not cause scaling problems in RO systems. Manganese in oxidized state is insoluble and forms a black precipitate of manganese dioxide. Manganese may cause fouling at an alert level of 0.05 ppm in the feed. As per drinking water regulation manganese concentration should not be more than 0.05 ppm due to its ability to cause black stains. Strontium Sulphate has low solubility and can cause problems at the back end of an RO system. The solubility of Calcium, Barium, and Strontium Sulphate is low and can cause RO scaling problems at the concentrate end of an RO system.

3.1.1 Calcium

Calcium is an indispensible part of healthy bones and teeth. It is absorbed through the skin and into the blood stream [4]. Most of the times, Calcium ions float freely, however, sometimes they do bond with other ions like sulphate, carbonate and bicarbonate in the seawater [9]. The variation for calcium is given in Figure 3.

![Figure 3. Variation of Calcium across ten locations](image)
3.1.2 Magnesium
Magnesium is the third most abundant ion found in seawater and usually has values higher than 1,200 ppm. It plays a momentous role in over 300 metabolic reactions in the body [11]. Its value was on the lower side at Salalah and Suwaiq during winter and summer respectively. The maximum value was found at Sohar during winter. Average value during summer is significantly low compared to winter as can be seen in Figure 4.

![Figure 4. Variation of Magnesium across ten locations](image)
3.1.6 Chloride

Seawater comprises around 55% Chloride ion, the most among all constituents [8]. Most of the locations have more values during winter. Figure 8 shows that chloride concentration is almost constant during winter. However, large fluctuations were observed during the summer season. During summer season, maximum and minimum values were found to be at Muttrah and Qurriyat, respectively.

3.1.7 Bromide

The value at Sur was on the higher side while at Qurriyat on the lower side during winter season. Figure 9 shows that the values during the two seasons were almost same except at Shinas.

3.1.8 Sulphate

Sulphate ions occur naturally in drinking water. These ions forms scales upon association with calcium. Typical value of Sulphate in seawater is about 2700 mg/L whereas, the recommended upper limit of it in potable water is 250 mg/L [6]. Switching abruptly from drinking water with low Sulphate to drinking water with high Sulphate concentrations causes diarrhoea [12,14]. Figure 10 illustrates that the concentration of Sulphate during summer is on higher side at almost all locations. It shows that solubility of Sulphate ions is low in summer. Minimum values of Sulphate was observed at Seeb and Salalah during winter and summer respectively. This is due to the fact that these places experience a low value of seawater temperature as compared to other locations.
4. CONCLUSION

The results of the analysis of the various major ions shows their variations during the summer and winter seasons. Most of the ions do not show much variation except for some locations. Calcium, potassium and sodium are higher at Seeb in summer. Chloride is typically low at Quriyat in summer. Bromide concentration is nearly constant at all locations. Sulphate is higher in summer at nearly all locations and is nearly constant at all locations during the respective seasons.

5. ACKNOWLEDGEMENTS

I am thankful to Oil and Water Analysis Lab of Petroleum Development Oman for allowing to perform the experimental work and Middle East Desalination Research Centre, Oman for its financial support through MEDRC Project No. 08-AS-002 and Dr. K.V. Reddy, Director MEDRC for his technical guidance which contributed to the successful completion of this research work.

REFERENCES

ENSEMBLE CLUSTERING USING PSO (WUM-PSO) – A META HEURISTIC APPROACH

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Higher College of Technology
Corresponding Author Email: sunitha.cheriyan@hct.edu.om

ABSTRACT

The data contained in web logs are innumerable and dissimilar. These data must be gathered together, compiled and converted in such a way that it can be made meaningful and understandable so that it can be utilized for knowledge creation.

Purpose – The task involved for achieving this seems to be too complex, which would provide some means to understand user behavior. This data when interrupted and collected will give meaningful new ideas to be really creative and help introduce new means and methods to explore user intentions thereby provide revolutionary breakthrough in web mining for the future. This paper focuses on learners and web masters to use the data in the web log file effectively for improving its effectiveness in understanding the Web as a whole. For achieving this we advise a design that can be used for formatting of data received during a user session. In addition to the above mentioned preprocessing and formatting tasks, the future work involves using data transformation methods that may influence the quality of the discovered patterns resulting from the use of mining algorithms.

The discovered patterns can then be used for various Web usage applications such as site improvement, business intelligence and recommendations. This work mainly deals with the analysis of web log data to develop and recommend frame work using web usage mining techniques like PSO, clustering, pruning with Markov model and association rule mining using Apriori algorithm as the base. The goal of this integrated approach is to make exact predictions with reduced complexity.

Keywords: WUM, PSO, Next Page Prediction, Path Completion, Preprocessing, Transaction Identification, Pruning, Web Log Data.

RELATED WORK: SEARCH RESULT CLUSTERING CAN BE CATEGORIZED INTO DIFFERENT TYPES FROM DIFFERENT PERSPECTIVES.

Traditional clustering can be broadly categorized into hierarchical and flat clustering. [8, 9]. In literature, is also known as clustering aggregation, clustering ensembles, and clustering combinations. It can be considered as a meta-clustering technique where multiple clustering whether same or different is combined to give an optimal clustering solution [10, 11].

1. INTRODUCTION

Web mining can be viewed as the analysis and discovery of information from the World Wide Web [4]. We can base these Information received in the way we collect these information for analysis. Hence web mining is used to collect and disperse, differentiate and create knowledge to identify what users are interested in internet. Data mining techniques can be applied to understand and find out the trends of web data usage and thereby help web mining. It can be used to understand the pattern of browsing behavior. Hence data mining when used for analyzing web patterns it actually means web mining. When we do the clustering on these data to analyze browsing patterns we can get the desired results. So we can conclude that through data mining we can collect, separate, arrange and give meaningful direction for the web users to get clear and correct information. These data from web logs can be used to classify it into separate sub divisions like

1. User groups which display similar patterns
2. Figuring out the groups that are relevant to search
3. Frequently accessed path (Fig: 1)

A wealth of information about the activities of visitors is available from web server log files. Web server log file entries typically look similar to this: 212.209.212.66 - [13/Jan/2015:00:35:33 +0500].

"GET/data-mining.htm HTTP/1.1" 200 11631 "http://internetengine.com/""Mozilla/4.0 (compatible; MSIE 5.5; sunitha.cheriyan@hct.edu.om"
Windows NT 5.0)."

2. METHODOLOGY

In preprocessing the aim is to remove redundant data and preserve only the data which is required from the raw web log and to format it in a way that can be easily used by the prediction model as in (Fig: 2).

![Architecture of Web Mining](image_url)

Fig: 2 Architecture of Web Mining

1. Data cleaning and preprocessing

Basic operations such as the noise reduction, handling missing data fields from the original dataset. Data cleaning is done by removal of repeated data and data which are not relevant (images, html resources, error pages etc.) from the log entries.

HTTP protocol is stateless since the connection is not lost until the request is complete. User’s browsing pattern is to be identified by eliminating irrelevant data such as image files, style sheets etc. which are not required to check the behavioral pattern of the web surfers. Web robots or spiders help in identifying the corresponding Web site’s content. Error’s requests are also irrelevant for our mining processes. Removal of these can be made by knowing the status of the requests. The error requests can be identified if the HTTP status code is 404. These log entries can be ignored.

2. User Identification

A web user can be characterized as the consumer using the client machine to collect information interactively which renders this information for knowledge recovery. Identifying these web users is greatly complex because of the presence of cache memory locally stored, the firewalls of corporate users and existence of the proxy servers.

i) A user can be related to an IP address

ii) If these IP addresses happens to be the same but the log record shows a different browser or if it comes from a different Operating System this IP address is a different use

iii) If access log together with referrer log is used to reach the same page then we have a another user with the same IP address

3. User Session Identification

The aim of identifying the user sessions is to segregate the page access of individual users into separate sessions. There are various techniques presently to identify the user sessions like

i) Time out mechanism[6]

ii) Maximal Forward Reference[7]
The authors intend to use the following rules for identifying the user sessions:

i) It is a new session if it is a new user
ii) In a particular session if the referrer page is null then it is a new session
iii) If the time between page requests prolongs a limit say more than ½ an hour, then also it is a new session
iv) Path Completion

Path completion is required because there is a need for filling missing page references. All the access is not found in the access log because of the presence of memory stored in local cache and proxy servers. When requests for a page is made by a client that is not linked to the last page, the referrer log can be checked to see from what page the request is made. We can assume that, if the page is in the user's recent request history, then the user has backtracked with the “back” button available on browsers, calling up cached versions of the pages until a new page is requested. When the user's history has a link to the requested page, it is presumed that the page closest to the requested page previously is the source for this request.

3. WEB MINING TECHNIQUES

Web mining can also be used together with the way traditional mining is done like the regular

1. Classification
2. Clustering
3. Association rule mining
4. Visualization

Here classification can be according to the user behavior. For example, the time that the person spends on browsing can give us the browsing behavior. We can make out a classic classification like, more time that the person spends during the hours 8:00 to 10:00 PM more likely is it for product/food.

The second level Clustering is when we can conclude that classification can be defined when clustering cannot be defined. We use this clustering for grouping together the items which are similar in a cluster and also figure out the possible differences between these items.

Whereas Association rule mining can be used to find the relationship between pages during the browsing period, thereby making a coincidence. For example traditionally if a person purchases a tooth paste the person is likely to purchase a tooth brush also. Similar coincidence can be made in browsing behavior also.

Visualization can be used to analyze the collected data for arriving at a result. It could be graphically analyzed as the wording goes “picture is worth a thousand words”. Hence a graph can be used to analyze web page mining which can assume paths negotiated by the users which in turn would facilitate the web analyst to realize and interpret results achieved [3].

Association Rule: - We suggest using Apriori Algorithm for locating frequent item sets during the pre-processing of item data after detecting the traversed path.

A-priori algorithm:

This frequent item set(s) is believed to be that set of transactions \( \sigma(s) \) that contains this item set. This frequent item sets are connected URL’s within these item sets [1]. The hyper edge weight can be viewed as the degree of similarities between these URLs called vertices. These hyper edges are subjected by summing up the confidence of all the possible association rules produced on the basis of these frequent item sets of these hyper edges.

Sequential Pattern: - Patterns are used to ascertain recurrent sequences from among voluminous amount of the sequential data. Sequential patterns are explored to uncover the sequential navigation patterns that appear in user’s sessions recurrently. The typical sequential pattern has the form [7]: the 70% of users who first visited A.html and then visited B.html afterwards, in the same session, have also accessed page C.html. Sequential patterns are syntactically similar to association pattern mining.

Clustering: - Clustering of web search result document has emerged as a promising tool for improving retrieval performance of an Information Retrieval (IR) system. Here we use clustering techniques to find out the possible cluster of things which are alike, from among the voluminous data in weblogs, based on the general idea of the function of distance. This will help in computing the proximity between groups. Clustering can be used in Web Usage mining to group together similar and repeated sessions.

Other than the basic information we get from Web log files, user profiles also help (by an online survey form) while clustering. For example: if we are asked to respond to questions like our interest, email, age, gender, hobbies etc., these data can be stored in the company’s customer database which may be used for further data mining purpose thereby identifying their customers.
Clustering can be used in Web Usage Mining to group together similar and recurrent sessions.

Other than the basic information we get from Web log files, user profiles also help (by an online survey form) while clustering. For example: if we are asked to respond to questions like our interests, email, age, gender, ethnicity, hobbies etc. These data can be stored in the company’s customer database which may be used for further data mining purpose thereby identifying their customers.

The datasets used are:

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Code</th>
<th>Period</th>
<th>Size (MB)</th>
<th>No. of Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA Kennedy Center Space</td>
<td>NASA</td>
<td>01-07-1995 to 31-08-1995</td>
<td>205.2</td>
<td>34,61,012</td>
</tr>
<tr>
<td>University of Saskatchewan</td>
<td>SASK</td>
<td>01-06-1995 to 31-12-1995</td>
<td>233.4</td>
<td>24,08,625</td>
</tr>
<tr>
<td>ClerkNet Internet Service Provider</td>
<td>CN</td>
<td>24-08-1995 to 31-09-1995</td>
<td>171</td>
<td>33,28,547</td>
</tr>
<tr>
<td>University of Calgary's</td>
<td>CL</td>
<td>24-10-1994 to 11-10-1994</td>
<td>52.3</td>
<td>7,26,739</td>
</tr>
</tbody>
</table>

Fig: 3 PSO

This section compares the results of the K-means, PSO and Hybrid clustering algorithms on six classification problems [2]. The main purpose is to compare the quality of the respective clustering’s, where quality is measured according to the following three criteria [5]:

- The quantified errors [5]
- The intra-cluster distances, i.e. the distance between data vectors within a cluster, where the objective is to minimize the intra-cluster distances;[2]
- The inter-cluster distances, i.e. the distance between the centroids of the clusters, where the objective is to maximize the distance between clusters.[2]

Clustering is used as follows:

1. Initialize the Cluster:
   i) Each object can be treated as a cluster.
   ii) Find similarity matrix of users.
2. Clustering:
   i) Identifying a pair of the most similar clusters and merging.
   ii) Computing the new centroid vector of new cluster using PSO variants [Fig: 3 PSO][2]
   iii) Computing the distances between new cluster and others.
   iv) Pruning and updating the similarity matrix.
   v) If the terminal condition is satisfied then output, Else repeat steps i) to iv).
3. Output:
   i) Output index table.
   ii) Output all clusters.
4. CONCLUSION & FUTURE WORK

The study of web mining’s today’s structure and tomorrow’s future are reviewed here. The target users can be identified by the clustering methods. Web data keeps growing and are difficult to manage at an ease. Web Mining is a most prominent field of research and day by day Several Effective applications are developed and implemented. We additionally propose the subtask of web mining & future of web mining. Currently we are also working with the procedure mining and also attempt to merge usage mining along with structure mining. Mining can also be implemented through the cloud. Cloud mining is less expensive. The optimization rules can be implemented on the cloud and in big data also.

REFERENCES

[1] Analysis of Web Usage Mining Swarna Latha Ampilli, Suresh Tippana
STRENGTH ANALYSIS OF CONCRETE (300/20) WITH SUPERPLASTICIZER

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ABSTRACT

Admixtures are used in concrete to obtain some specific properties to enhance the performance of concrete. In this research concrete of a specific grade (300/20) with a superplasticizer Ha Be has been selected to enhance the reliability on the use of admixture in concreting. In the introduction part of the research properties of superplasticizer are discussed while later the technical data of Ha Be and result of different test on concrete are discussed. Initially materials / ingredients of concrete (300/20) are specified and correction for moisture have been made for 1 cum. A total of six design batches are selected to prepare a total of 36 cube of standard size (150mm x 150mm 150m). To know the workability, the slump have been conducted at six stages i.e. initial, at 30 minutes, 45 minutes, 60 minutes, 75 minutes and at 90 minutes. The study shows that the concrete with the use of this specific superplasticizer (Ha Be) get the desired workability (slump value 150+25 mm) at 60 minutes, and it is concluded that such superplasticizer are recommended where transportation of concrete required 60 minutes. Since concrete gain a significant strength at seven days and remaining strength is gained at 28 day, therefore 18 cubes have been crushed at an age of 7 days, while remaining 18 have been crushed at an age of 28 days. These strength especially the 28th day strength (average value = 53 Mpa) has been compared with the required one (46 Mpa) and was found satisfactory. The densities of all the 36 cubes were also computed at two stages to compare it with the required density (2400 kg/m3). Both the calculated densities at 7 days for 18 cubes and at 28 days for 18 cubes was compared and found satisfactory.

At the end it is concluded that if any superplasticizer is required to get some specific properties it can be use confidently since it not affected on the strength at all. Although since the research is only focusing on the strength at upto 28 days therefore it is also required to study the behavior of concrete at later stages to see there is any adverse effect in concrete due to the use of any superplasticizer.

KEYWORDS: Superplasticizer, Ha Be, concrete (300/20), cube, strength, slump, density, 7 days, 28 days.

1. INTRODUCTION

Super plasticizers are commonly used in concrete as admixture especially in ready mix concrete as well as in production of reinforced and pre stressed precast concrete elements. It can transform low slump concrete (~ 25 mm slump) without any admixture at the same water cement ratio into an easy processable concrete and even into a flow concrete with a slump of minimum 200 mm. Cohesion properties of different superplasticizer can minimize segregation and bleeding tendencies of concrete. Some of the super plasticizers are especially applicable under hot weather conditions, such as Microsilica concrete, pumped concrete and for concretes with increased workability requirements and a long workability time. Keeping inview the above this investigation has the objective to study the strength of different trial mix design of class 300/20 concrete prepared with superplasticizer to enhance the reliability on admixture or superplasticizers.

1.1. Properties of Concrete Grade 300/20

The desired properties of concrete grade 300/20 are available in Table 1.

Table 1. Properties of concrete grade 300/20

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grade of concrete</td>
<td>300/20</td>
</tr>
<tr>
<td>2</td>
<td>Workability, slump value – mm without admixture</td>
<td>75+25</td>
</tr>
<tr>
<td>3</td>
<td>Workability, slump value – mm with admixture</td>
<td>150+25</td>
</tr>
<tr>
<td>4</td>
<td>Density (kg/m3)</td>
<td>2400</td>
</tr>
<tr>
<td>5</td>
<td>28 days cube strength N/mm2</td>
<td>46,0</td>
</tr>
</tbody>
</table>

1.2. Objective of Research

The consequent objectives in this research are to:

a) Prepare trial design for 1 cum
b) Correction of weight for trial design after moisture correction [1]
c) Prepare cube of standard size (150mm x 150mm x 150mm)
d) Compute the weight and density of the cubes
e) Observe the slump value trial batches at six stage
f) Compute the compressive crushing at 7 days as per BS 1881 Part-116
g) Compute the compressive crushing strength at 28 days as per BS EN 12390 Part 3

Since concrete gain approximately 67 % of strength at an age of 7 day and approximately 100 % strength are gained at the age of 28 days therefore in this research these times are considered for the trial design [2]. Concrete cylinder (150mm x 300mm) can also be prepared for testing as specified by other standards; however available resources, and time did not permit to do so, and only cubes are prepared and tested considering that both the standards are comparable to each other’s.

2. RESEARCH METHODOLOGY

2.1. Trial Mix Design for Class 300/20

In this study trial mix design of class 300/20 concrete are prepared for 1 cum with superplasticizer Pantarhit® (Ha Be) which complies with the requirements of BS EN 934-2 and ASTM C494 Type G (table 2). A total 36 cubes from six batches have been prepared and 18 were crushed after 7 days of casting and remaining 18 have been crushed after 28 days of casting to know the final strength of concrete. From every batch, six cubes were casted, in which three were crushed at seventh day and remaining three were crushed at 28th day. The slump values were measured at six stages for all the batches.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steadiness</td>
<td>Homogenous</td>
</tr>
<tr>
<td>2</td>
<td>Color</td>
<td>Dark brown</td>
</tr>
<tr>
<td>3</td>
<td>Active substances</td>
<td>Naphthalene sulphonate with additives</td>
</tr>
<tr>
<td>4</td>
<td>State</td>
<td>Liquid</td>
</tr>
<tr>
<td>5</td>
<td>Density</td>
<td>1.22 ± 0.03 g/cm³</td>
</tr>
<tr>
<td>6</td>
<td>pH-value</td>
<td>9±1</td>
</tr>
<tr>
<td>7</td>
<td>Chloride content</td>
<td>Chloride free acc. to EN 934:1</td>
</tr>
<tr>
<td>8</td>
<td>Alkali content as</td>
<td>Na2O-equivalent &lt; 8.5 mass-%</td>
</tr>
<tr>
<td></td>
<td>a Na2O-equivalent</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Workability</td>
<td>From +1 °C</td>
</tr>
<tr>
<td>10</td>
<td>Shelf life</td>
<td>Approx. 1 year</td>
</tr>
<tr>
<td>11</td>
<td>Storage</td>
<td>In closed containers, cool, but frost-free. Protect from intense solar radiation</td>
</tr>
</tbody>
</table>

(www.ha-be.com)

The design weights of different material / ingredients for trial mix of 300/20 concrete for 1cum without correction are mentioned in the following table 3. The corrected design weight of different materials / ingredients of concrete 300/20 after moisture correction are shown in table 4.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Material / ingredient</th>
<th>Design weight for 1 cum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cement (OPC)</td>
<td>390 kg</td>
</tr>
<tr>
<td>2</td>
<td>Micro Silica(Ferro pem)</td>
<td>27.3 kg</td>
</tr>
<tr>
<td>3</td>
<td>Water Cement Ratio</td>
<td>0.43</td>
</tr>
<tr>
<td>4</td>
<td>Ha Be</td>
<td>9.2 kg</td>
</tr>
<tr>
<td>5</td>
<td>Water</td>
<td>179 kg</td>
</tr>
<tr>
<td>6</td>
<td>5 - 10 mm CA-1</td>
<td>450 kg</td>
</tr>
<tr>
<td>7</td>
<td>10- 20 mm CA-2</td>
<td>610 kg</td>
</tr>
<tr>
<td>8</td>
<td>Wash Natural sand</td>
<td>740 kg</td>
</tr>
</tbody>
</table>
Table 4. Design weight of materials / ingredients of 300/20 concrete for 1 cum after moisture correction

<table>
<thead>
<tr>
<th>Materials</th>
<th>Wt for 1.0 M³</th>
<th>Wt for 0.03 M³</th>
<th>NMC</th>
<th>Water Abs</th>
<th>Water</th>
<th>Total Water</th>
<th>Corrected Wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement (OPC)</td>
<td>390</td>
<td>11.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>390</td>
</tr>
<tr>
<td>Micro Silica (Ferro Pem)</td>
<td>27.3</td>
<td>0.819</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>27.3</td>
</tr>
<tr>
<td>Ha Be</td>
<td>9.2</td>
<td>0.276</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>Water (Corrected)</td>
<td>179</td>
<td>5.37</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>179.24</td>
</tr>
<tr>
<td>Natural Washed Sand</td>
<td>740</td>
<td>22.2</td>
<td>3.0</td>
<td>1.6</td>
<td>1.4</td>
<td>10.36</td>
<td>750.4</td>
</tr>
<tr>
<td>10 ~ 20 mm</td>
<td>610</td>
<td>18.3</td>
<td>0.1</td>
<td>1.1</td>
<td>-1.0</td>
<td>-6.10</td>
<td>603.9</td>
</tr>
<tr>
<td>05 ~ 10 mm</td>
<td>450</td>
<td>13.5</td>
<td>0.2</td>
<td>1.2</td>
<td>-1.0</td>
<td>-4.50</td>
<td>445.5</td>
</tr>
</tbody>
</table>

3. LABORATORY ANALYSIS, OBSERVATION AND DISCUSSION

3.1. Slump Test

After moisture correction the slump test to determine the slump value as per relevant standards procedure [3] has been conducted at six stages as under (table 5). As the noted from table No. 5, the slump value drop gradually as time passes. The figure No.1 shows the relationship between time and drop in slump value for batch No.1 with a regression value of 1. (R² = 1).

Table 5. Values of Slumps for different batches at different times

<table>
<thead>
<tr>
<th>Batch No.</th>
<th>Value of Slump (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
</tr>
<tr>
<td>1</td>
<td>220</td>
</tr>
<tr>
<td>2</td>
<td>220</td>
</tr>
<tr>
<td>3</td>
<td>220</td>
</tr>
<tr>
<td>4</td>
<td>220</td>
</tr>
<tr>
<td>5</td>
<td>210</td>
</tr>
<tr>
<td>6</td>
<td>220</td>
</tr>
</tbody>
</table>

Table 6. Maximum and minimum value of slump (ACI 211.1) [4]

<table>
<thead>
<tr>
<th>Description of Concrete Work</th>
<th>Slump, mm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum</td>
</tr>
<tr>
<td>Reinforced Foundation Walls and Footings</td>
<td>75 (3)</td>
</tr>
<tr>
<td>Plain Footings, Caissons, and Substructure Walls</td>
<td>75 (3)</td>
</tr>
<tr>
<td>Beams and Reinforced Walls</td>
<td>100 (4)</td>
</tr>
<tr>
<td>Building Columns</td>
<td>100 (4)</td>
</tr>
<tr>
<td>Pavements and Slabs</td>
<td>75 (3)</td>
</tr>
<tr>
<td>Mass Concrete</td>
<td>75 (3)</td>
</tr>
</tbody>
</table>
3.2. Seven days Strength:

Cubes of standards size (150mm x 150mm x 150mm) have prepared and after curing for 7 days these cubes have been crushed with a universal testing machine to know the crushing strength of these cubes. A total of 18 cubes from different baths were crushed and the strength results were noted as shown in the table 7.

Table 7. Compressive strength of concrete cube 300/20 at 7 days (BS 1881 Part-116)

<table>
<thead>
<tr>
<th>Specimen Reference</th>
<th>Date of Casting</th>
<th>Date of Crushing</th>
<th>Batch No.</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Weight (kg)</th>
<th>Density (kg/m³)</th>
<th>Compressive Strength (Mpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22.07.2014</td>
<td>29.07.2014</td>
<td>1</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8675</td>
<td>2570</td>
<td>42.0</td>
</tr>
<tr>
<td>2</td>
<td>22.07.2014</td>
<td>29.07.2014</td>
<td>1</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8710</td>
<td>2581</td>
<td>43.0</td>
</tr>
<tr>
<td>3</td>
<td>22.07.2014</td>
<td>29.07.2014</td>
<td>1</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8722</td>
<td>2584</td>
<td>42.5</td>
</tr>
<tr>
<td>4</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>2</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8721</td>
<td>2584</td>
<td>43.5</td>
</tr>
<tr>
<td>5</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>2</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8688</td>
<td>2574</td>
<td>39.5</td>
</tr>
<tr>
<td>6</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>2</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8862</td>
<td>2626</td>
<td>42.5</td>
</tr>
<tr>
<td>7</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>3</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8628</td>
<td>2556</td>
<td>42.5</td>
</tr>
<tr>
<td>8</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>3</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8636</td>
<td>2559</td>
<td>43.0</td>
</tr>
<tr>
<td>9</td>
<td>24.07.2014</td>
<td>31.07.2014</td>
<td>3</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8644</td>
<td>2561</td>
<td>40.5</td>
</tr>
<tr>
<td>10</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>4</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8566</td>
<td>2538</td>
<td>37.0</td>
</tr>
<tr>
<td>11</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>4</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8631</td>
<td>2557</td>
<td>40.0</td>
</tr>
<tr>
<td>12</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>4</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8612</td>
<td>2552</td>
<td>38.0</td>
</tr>
<tr>
<td>13</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>5</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8644</td>
<td>2561</td>
<td>39.0</td>
</tr>
<tr>
<td>14</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>5</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8589</td>
<td>2545</td>
<td>40.5</td>
</tr>
<tr>
<td>15</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>5</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8699</td>
<td>2577</td>
<td>41.0</td>
</tr>
<tr>
<td>16</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>6</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8654</td>
<td>2564</td>
<td>40.0</td>
</tr>
<tr>
<td>17</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>6</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8568</td>
<td>2539</td>
<td>40.5</td>
</tr>
<tr>
<td>18</td>
<td>25.07.2014</td>
<td>01.08.2014</td>
<td>6</td>
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<td>150</td>
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<td>8664</td>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40.8</td>
</tr>
</tbody>
</table>

3.3. Twenty Eight days Strength

Later on the 18 cube of the same trial design from different batches have been crushed after 28 days to know the overall (28 days) strength as per BS EN 12390 Part 3. The results of these tests are appended in the table 8.
Table 8. Compressive strength of concrete cube 300/20 at 28 days (BS EN 12390 Part 3)

<table>
<thead>
<tr>
<th>Specimen Reference</th>
<th>Date of Casting</th>
<th>Date of Crushing</th>
<th>Batch No.</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Weight (kg)</th>
<th>Density (kg/m³)</th>
<th>Compressive Strength (Mpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22.7.14</td>
<td>19.8.14</td>
<td>1</td>
<td>150</td>
<td>150</td>
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</tr>
<tr>
<td>2</td>
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<td>19.8.14</td>
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<td>150</td>
<td>150</td>
<td>150</td>
<td>8629</td>
<td>2557</td>
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</tr>
<tr>
<td>3</td>
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<td>150</td>
<td>150</td>
<td>150</td>
<td>8660</td>
<td>2566</td>
<td>54.5</td>
</tr>
<tr>
<td>4</td>
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<td>150</td>
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<td>8626</td>
<td>2556</td>
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</tr>
<tr>
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<td>150</td>
<td>150</td>
<td>8660</td>
<td>2566</td>
<td>54.5</td>
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<tr>
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<td>150</td>
<td>150</td>
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<td>54.0</td>
</tr>
<tr>
<td>7</td>
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<td>19.8.14</td>
<td>2</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>8648</td>
<td>2562</td>
<td>53.0</td>
</tr>
<tr>
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<td>19.8.14</td>
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<td>150</td>
<td>150</td>
<td>8659</td>
<td>2566</td>
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<td>25.7.14</td>
<td>22.8.14</td>
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<td>150</td>
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<td>8621</td>
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<td>8648</td>
<td>2562</td>
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<td>4</td>
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<td>150</td>
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<td>150</td>
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<tr>
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<td>8636</td>
<td>2559</td>
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</tr>
<tr>
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<td>150</td>
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<td>8598</td>
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<td>54.0</td>
</tr>
<tr>
<td>17</td>
<td>25.7.14</td>
<td>22.8.14</td>
<td>6</td>
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<td>150</td>
<td>150</td>
<td>8574</td>
<td>2540</td>
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<td>22.8.14</td>
<td>6</td>
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<td>150</td>
<td>150</td>
<td>8603</td>
<td>2549</td>
<td>51.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>53.0</td>
</tr>
</tbody>
</table>

3.4. Strength Variance and Standards Deviation

The variance of 28 days strength and standards deviation were computed as in table 9 which comply with the ACI allowable risk which state that there should be less than 10% chances that the strength of a concrete is less than specified strength.

4. CONCLUSION

It is noted from table 1 that concrete grade 300/20 should give a slump value of 150±25 mm if the admixture have been used. From the table 5 the values of slumps taken at 90 minutes for all six batches are within the range specified in table 1. Therefore it is concluded that concrete of class 300/20 with the use of Ha Be admixture as specified in table 2 can be used within 90 minutes. Comparing the 28 days strength of trial batches of 18 cubes as specified in table 8 is also compactable with the required strength mentioned in table 1. Meanwhile the values of density obtained during laboratory analysis (table 8) were also compared with the required density as specified in table 1 for class 300/20 concrete, and it is noted that these values are satisfactory. It is further noted from table 5 that the laboratory values of slumps at initial stage, 30 minutes, 45 minutes and 60 minutes are higher than the required values (150±25) of slump for the concrete grade 300/20. In other words it can be concluded that using this concrete within initial 60 minutes is not appropriate. However as such concrete are mostly produced in the concrete batching plants and generally batching plants and the area of construction are always away from each other therefore there is a time requirement for transportation as well. Hence it can be said that the initial 60 minutes can be consumed for transportation. If the batching plant and area of construction are closer to each other, then the use of plasticizer can be avoided, however since from the result it never effect the concrete properties as described in table1. Meanwhile the standards deviation (1.8 Mpa) as shown in table 9 was also computed and found satisfactory.

It is concluded that although there is no adverse effect on the strength of concrete with use of superplasticizer. However since in this research, the strength of concrete at only two stages i.e. 7th day and 28th day was computed, therefore the possibility of adverse effect in future may occur and can’t be ignored.
Table 9. Variance of compressive strength and standards deviation based on 28 days strength

<table>
<thead>
<tr>
<th>Specimen Reference</th>
<th>Batch No.</th>
<th>Compressive Strength</th>
<th>Achieved Mean Strength</th>
<th>Variance $\delta$</th>
<th>Variance $\delta^2$</th>
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<tr>
<td>1</td>
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<td>-2.0</td>
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<tr>
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<td>4.00</td>
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</table>

Variance of Compressive Strength 3.3 Mpa
Standards Deviation Achieved 1.8 Mpa

REFERENCES

ANALYSIS OF THE IMPORTANCE OF COMPRESSIVE SENSING IN SENSOR NETWORKS

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ABSTRACT
The conventional signal processing methods which has laid their foundation with the sampling theorem, produces gigantic volume of useless data during the series of processes associated with signal processing. Compressive Sensing is an innovative platform for signal processing, which offers more practical methods to solve the issues of voluminous data generated by the conventional paradigm. It can overcome the limits of Sampling Theorem and can offer much more to address the associated issues. The Compressive Sensing concept proposes that sparse signals can be successfully reconstructed from fewer samples which are acquired at a much lower rate than the Nyquist rate. The theory is trying to simplify the process of sampling, encoding and compressing into a single step process simultaneously. Through this paper the compressive sensing scenario is examined through the Sensor Networks perspective. Along with this, the paper puts an effort to analyze the logistical, processing and storage challenges in consort with other major concerns in the realm using the Compressive Sensing Approach as an effective tool. From the study and analysis it can be inferred that most of the challenges can be defied comfortably with the help of Compressive Sensing.

Keywords: Compressive Sensing, Sensor Networks, Sparsity, Sampling, Nyquist Rate

1. INTRODUCTION
The current epoch of information explosion is characterized with various high resolution sensing systems, which is revolutionizing the entire digital world. The efficient communication and storage of signals from these systems has been evolving as the fundamental challenge in communication Engineering. Even though the transmission technologies have faced drastic advancement to deal with the emerging challenges of information explosion, sampling theorem remains as one of the very basic theorems in the field of digital signal processing and communication for decades. Though, Nyquist Sampling Theorem [1],[2] is the basic governing rule for digital communication world, it is placing so many constraints and challenges in communication.

In this paper we are analyzing the sampling theorem, and how the limitations of the theorem will become severe with the data deluge problem of information explosion created by the sensor networks. The paper studies the compressive sensing perspective of sensor networks to identify the potential of compressive Sensing to create revolutionary changes in sensor networks. It analyses the data deluge problem raised by the sensor networks and try to relate Compressive Sensing as one of the promising solution.

2. THE CONVENTIONAL PARADIGM
A. Sampling Theorem
Sampling [1], [2] is the process of converting a signal which is a function of continuous time into a numeric sequence, which is a function of discrete time. This is the first step in the process of conversion of an analog signal to a digital signal. This helps to reduce the volume of data to be processed and transmitted by only taking samples instead of the signal completely.

The conventional approach of reconstructing the sensed signals from measured data obeys the Shannon Sampling Theorem. The principal impact of the Shannon sampling Theorem is that it replaces a continuous band-limited signal by a discrete sequence of its samples without the loss of any information. As per the sampling theorem, if a function x (t) contains no frequencies higher than fmax cps , the sufficient sample rate is 2fmax samples/second, or anything larger that for perfect reconstruction of the signal. The theorem specifies the lowest sampling rate to reproduce the original signal.

In many applications, the resulting Nyquist rate is very high that result in too many samples. It may be very costly, or sometimes physically impossible, to make a capable system to acquire the samples at the necessary rate. Thus, regardless of the surprising advances in the processing power of the high level chips, the acquisition and processing of signals in most of the application areas remains to pose massive challenges.
But there are many situations where we can do well with fewer samples. If the signal is strictly cyclic and repetitive in nature, most of its energy will be concentrated in few significant frequency components. Here we can go for low rate sub-Nyquist sampling, without compromising on quality.

There exist certain other cases where the Nyquist rate will be not enough for perfect reconstruction. If the signal contains significant higher order harmonics, the Nyquist rate will not be sufficient to obtain all the details. In this case we need a higher rate. So from the above discussion it is evident that there are numerous situations in the communications arena, where Nyquist theorem is inadequate and needs modifications, even though it is being considered as a standard. Here lies the importance of Compressive Sensing concept as a better customizable option.

B. Sensor Networks Environment

The progress in all the fields of human life is the result of the developments in science and technology. These developmental processes produce different types of information in different levels. The enormous amount of information produced in the digital world from various sensors on a day-to-day basis is known as the information explosion. This huge data has to be communicated, stored, managed, visualized, Summarized, and finally analyzed to make sense, which is becoming a herculean task in the present Scenario. As the capabilities of digital devices rise and prices fall, sensors and processing systems are creating and digitizing gigantic amount of new information.

As per Moore’s law, the overall processing power of processor chips will be doubled and their prices will be halved approximately in every two years. The software programs for managing the processes are also getting better. This will create more and more primary and secondary data. Along with the rapid developments in sensor networks, communication and IT sector, Information Technology Enabled Service (ITES) are also progressing which will contribute more to the data generation and communication overload. The number of computer literates is increasing exponentially as more people are able to interact with the information. So the technological advancement and the increase in the number of persons using the technology are contributing the main part in the data generation, making the data deluge problem worst.

The overflow of data from various sensors and other processing systems surpassed the capacity of all the storage technologies in 2007. The trend of data growth [3], [4], [5], which is very difficult to control, is ongoing. For example, the global mobile cellular subscriptions have grown to 6915 million in 2014 from 2205 million in 2005. Also the global internet users have increased to 2923 million in 2014 from 1024 million in 2005. The Global Information and Communications Technology (ICT) development from 2001 to 2014 per 100 inhabitants is shown in figure 1.

![Fig.1. Global ICT Developments, 2001-2014.](image)

At present the entire scenario is governed by traditional sampling, which creates huge data in the sensor networks environment which is difficult to process, communicate and store. As indicated earlier, this approach becomes not practical if the signal of interest contains only small number of significant frequencies and the band limit is too large. It is challenging to build sampling hardware that operates at sufficient rates, which is very high normally. As the sampling rate is higher, more samples will be produced in unit time. So the speed of the hardware and the data rates should be increased to meet this high speed requirement. So the complexity and the cost of the equipment will increase along with the faster devices. Instead of the faster devices, if slower devices are used, the compromise will be in the processing time.

So many related consequences are also accompanying with this. With the increased sampling rate, more noise will be added to the system. The power consumption and cost of the system will be increased. Especially for the battery operated instruments, the battery life will be critical. The data deluge will be eventually
resulting in congestion and collisions in data traffic, which will lead to data loss. The speed, storage space requirement and safety of the database also need to be improved drastically to cater these huge data. This also needs specialized and sophisticated software packages to control and monitor the entire system.

From the above discussion it is clear that if the sampling is based on Shannon’s Theorem, there are so many hurdles you need face during the implementation stage mainly due to the large amount of data to be handled by the sensor systems. So reducing the data volume will be one of the basic solutions to control most of the issues mentioned above and to reduce the overheads in the communication and storage. We need to search for alternate sampling methods to reduce the sampling rate. In this context, Compressive sensing is offering a viable solution for the sensor networks.

3. COMPRRESSIVE SENSING SCENARIO

A. Theoretical Overview

In the traditional transform coding, first we will collect, say N number of samples as per the sampling theorem to measure the specified process. Generally N will be very large and we need to find the transform coefficients of these N samples. Out of these N transform coefficients, only K largest elements are taken and the remaining samples are discarded. Then these K largest elements are encoded. The rest of the transform coefficients other than the significant coefficients are rejected making the data collection and sampling process rather wasteful. Instead of storing and discarding many measurements, it will be more efficient if we acquire only the needed signals to start with. In this attempt, measurement and compression is performed simultaneously [6]. So in Compressive Sensing, we are directly acquiring the compressed samples with linear projections, without passing through the intermediate stages.

Compressive Sensing can be applied to the situations where Nyquist rate sampling is neither feasible nor efficient. Compressive Sensing or Sub-Nyquist Sampling or Compressive Sampling or Compressed sensing [6], [7], [8] is a very simple and efficient signal acquisition protocol which samples at a very low rate than Nyquist rate and later uses computational power for reconstruction from the samples, which appears to be an incomplete set of measurements. Compressive Sensing can give sparse solutions for underdetermined linear systems and will be able to reconstruct the original signals from very few samples. Compressive Sensing depends on two principles for this: sparsity and incoherence. Sparsity is connected with the signals of interest and incoherence is related to the sensing modality.

Sparsity [7] expresses the idea that the information rate of a continuous time signal can be much smaller than suggested by its bandwidth. Most of the Natural signals can be expressed in compressed form, in terms of their projections on a suitable basis. If we are selecting a proper basis, a large number of projection coefficients will be zero. So these coefficients can be snubbed. If a signal has only K non-zero coefficients in a domain, it is said to be K-Sparse. A signal is said to be compressible if most of these projection coefficients are small enough and can be ignored. So the number of samples required for reconstruction can be reduced considerably. In Compressive Sensing [6], [7], [8], we are concerned with two matrices - the incoherence matrix which is used to sample the signal of interest (measurement matrix) and the matrix to represent a suitable basis, in which the signal of interest will be sparse (representation matrix). Within the Compressive Sensing framework, low coherence between these two matrices translates to fewer samples required for reconstruction of signal. The measurement process is non-adaptive in that, it does not depend in any way on the signal x(t). From the random measurements, the signal can be recovered using Convex Optimization Methods or Greedy Algorithms.

Compressive Sensing combines both the sampling and compression into single step by measuring minimum samples that contain maximum information about the signal. It eliminates the need to obtain and store large number of samples only to drop most of them because of their negligible values as in traditional sampling. So this approach is far more efficient in data acquisition. This can offer more benefits in the fields of data communication; data storage, data management and data analysis as the number of signals will be lesser and less data will be generated from each measurement set up. This will result in the reduction of data collection time and energy consumption. This will also extend the battery life of the sensor networks.

B. Orthogonal Matching Pursuit Algorithm

We have used Orthogonal Matching Pursuit algorithm [9], [10] for the reconstruction of the signals, which belong to the class of Greedy Algorithms. Greedy algorithms are a group of powerful algorithms for reconstructing sparse representations, which rely on iterative approximation of the signal coefficients. Our study is concentrated on Orthogonal Matching Pursuit (OMP). OMP is one type of Greedy Algorithms, which are based on Matching Pursuit. Matching pursuit is a prominent group of greedy iterative algorithms, which decomposes a signal into a linear expansion of functions that constitute a
redundant dictionary. This algorithm was introduced by Mallat and Zhang [10]. Matching Pursuit algorithm selects dictionary elements in a greedy fashion that best approximate the signal, at each iteration of the algorithm. This algorithm addresses sparsity preservation of the signal in the dictionary directly and completely recovers the elements of the signal that are described by the dictionary elements.

Orthogonal Matching Pursuit (OMP) is an extension on Matching Pursuit. The principle is the same as Matching Pursuit. In each iteration, one element is picked from the dictionary that will best approximate the residual. But besides simply taking the scalar product of the residual and the new dictionary element to get the coefficient weight, the original function is fit to all the already selected dictionary elements via least squares or projecting the function orthogonally onto all selected dictionary atoms. So this algorithm is termed as orthogonal matching pursuit [9], [10].

4. LITERATURE SURVEY

Scott Pudlewski et al [11] investigated the ability of the compressed sensing concept for video streaming in Wireless Multimedia Sensor Networks with the aim to maximize the received video quality. They have designed a rate control algorithm which regulates the video encoding rate and the channel coding rate together at the physical layer based on the projected channel quality scheme. Volkan Cevher et al [12] developed algorithms for the signal processing of randomly deployable wireless sensor arrays, which are having severe communication bandwidth constraints. While focusing on the acoustic bearing estimation problem, they modeled the target bearings as a sparse vector in the angle space. They converted this as a solution of an 11-norm minimization problem. J. Oliver and Heung-No Lee [13] suggested a new framework for sensor networks with compressive sensing. They concluded that the prior knowledge of the channel between the sensors and the signals will enable an effective sensing matrix design and which will finally supports a good signal recovery. Hung-Wei Chen et al [14] proposed a framework to capture compressed video data directly, while exploiting correlations between the successive frames for video reconstruction at the decoder side. This reconstruction can be articulated as a convex unconstrained optimization problem through identifying the sparse coefficients in respect of some elementary functions. Guojin Liu et al [15] have developed a class of in-network signal processing algorithms for the accurate picking of arrival times of primary waves acknowledged by seismic sensors, involved in the volcano monitoring. They extended these with signal preprocessing at sensors, sensor selection along with compression and reconstruction algorithms. Jeonghun Park et al [16] proposed a general scheme to improve sparse signal detection performance, without a prior knowledge on correlation structure for the case of arbitrarily correlated multi signal ensembles. They found the theoretical bound on the required number of measurements using their scheme. J. A. Tropp and A. C. Gilbert [17] demonstrated that Orthogonal Matching Pursuit can reliably recover a signal with N nonzero entries in a suitable dimension D, if O random linear measurements of that signal are given. They suggested that the OMP algorithm can be an alternative to Basic Pursuit for signal recovery problems in some settings as it is faster and easier to implement. Eugene Livshitz [18] studied the properties of sensing matrix to get optimal and minimal iterations in OMP for recovery.

Xinyu Zhang et al [19] described an OMP based algorithm for signal reconstruction, by adding a negligible additional complexity in the basic algorithm by introducing a preprocessing step that converts the signal into a distribution that can be reconstructed more easily. George C. Valley and T. Justin Shaw [20] presented a new approach by adding a nonlinear least squares step to OMP iteration to increase accuracy when the parameters of the signal are not lying on a grid and the sparsifying transform is not known. T. Tony Cai and Lie Wang [21] presented a fully data driven OMP algorithm based on a small number of noisy linear measurements with explicit stopping rules for the recovery of a high-dimensional sparse signal. Alyson K. Fletcher and Sundeep Rangan [22] have shown that OMP can reconstruct a k-sparse n-dimensional real vector from 4 k log(n) linear measurements acquired through a random Gaussian measurement matrix with a probability that approaches to one a robust reconstruction method based on OMP with partially known support using subsampled compressed signal ensemble from the compressed signal with reduced Gaussian Noise. The method has yielded higher peak signal-to-noise ratio at low measurement rate and better quality. Long Jingfan et al [24] have shown that a K-sparse signal can be recovered using OMP with less number of iterations, if the sensing matrix satisfies the conditions of RIP and coherence.

5. METHODOLOGY

This work has been done as a pilot study to identify the potentiality of Compressive Sensing in the sensor networks environment. Here we are trying to reconstruct an image with lesser number of samples using the Compressive Sensing Methods. As the number of samples required for the reconstruction is reduced, the image can be represented with fewer coefficients and the storage and communication needs will be reduced considerably. The result can be used to generalize the fact that for any type of sensor networks, which produces sparse signals, we can reduce the communication overheads by applying the Compressive Sensing methods.

Software – MATLAB 7.0.1

Reconstruction Algorithm – Orthogonal Matching Pursuit
A. Algorithm
Input:
A measurement matrix $\Phi \in \mathbb{R}^{m \times n}$
Observation vector $y \in \mathbb{R}^m$
Sparsity level $k$ of the ideal signal $x \in \mathbb{R}^n$
Output:
\[ \hat{x} \in \mathbb{R}^n \text{ of the ideal signal} \]
\[ \Lambda, a \in \mathbb{R}^n \text{ containing the positions of the non-zero elements of } x \]
An approximation to the measurements $y$ by $a_k$
The residual $r = y - a_k$

1: $r^{(0)} \leftarrow y$
2: $\Lambda^{(0)} \leftarrow \emptyset$ (Initialize the indices)
3: for $i = 1...k$ do
4: $\lambda^{(i)} \leftarrow \arg\max_j \{ r^{(i-1)} \Phi_j \}$
5: $\Lambda^{(i)} \leftarrow \Lambda^{(i-1)} \cup \lambda^{(i)}$
6: $\Phi^{(i)} \leftarrow [\Phi^{(i-1)} \Phi_{\lambda^{(i)}}]$
7: $\hat{x}^{(i)} \leftarrow \arg\min_x \{ \| y - \Phi^{(i)} \hat{x} \|_2 \}$
8: $a^{(i)} \leftarrow \Phi^{(i)} \hat{x}^{(i)}$ (New data approximation)
9: $r^{(i)} \leftarrow y - a^{(i)}$ (New residual)
10: end for
11: $\hat{x} \leftarrow \hat{x}^{(k)}$
12: return $\hat{x}, \Lambda^{(k)}, a^{(k)}, r^{(k)}$

6. RESULTS AND DISCUSSIONS
Here we have taken the two famous standard test images – Lenna and Cameraman, in which the signal processing is performed using the OMP algorithm and reconstructed the images with different compression percentages of 100%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20% and 10% when comparing with Shannon’s rate. Even though the image quality is deteriorating with lower compression percentages, we were getting satisfactory reconstruction of the image till 30% with all important details and below that the images lacks some important details. This is giving an inference that we can reconstruct sparse signals satisfactorily with sub-Nyquist sampling rate. If it is possible for a sparse image, we can definitely apply this to other sensor network signals, which are sparse. So we can generalize the fact that for the sensor networks we can apply the various compressive sensing algorithms to resolve the issues concerned with the data deluge problems if the concerned signal is sparse or can be made sparse by converting in to a suitable domain.

7. ANALYSIS OF THE ROLE OF COMPRESSION SENSING IN DATA DELUGE BASED ON THE STUDY
Now let’s analyze the effect of Compressive Sensing in the Data Deluge Problem created by the prominent networks. As per the analysis, the compressive sensing algorithms are able to give satisfactory output of the input sparse signal with around 30-40% of samples out of the Nyquist sample spectrum for the image signal. So it can provide better results for still lower rates, when considering the data traffic. The annual global IP data traffic increased to 30 Exabyte in 2014 from 18 Exabyte in 2013. The prediction for
2016 and 2018 are 1.1 Zettabyte and 1.6 Zettabyte respectively. If compressive sensing will come in to the lead role, we can reduce the predicted ranges to below 600 Exabyte and 800 Exabyte. Similarly the global mobile traffic is also growing at a compound annual growth rate of 57 percent from 2014. It is expected that the annual global mobile traffic will reach 292 Exabyte by the end of 2019, from 30 Exabyte in 2014. So the flooding in the global mobile and IP network can be considerably reduced by Compressive Sensing. Subsequently the storage requirement also will be reduced considerably.

Table I. Global Mobile Data Traffic Projection for 2019 (EB/Month)

<table>
<thead>
<tr>
<th>Nyquist Rate</th>
<th>60% of Nyquist Rate</th>
<th>50% of Nyquist Rate</th>
<th>40% of Nyquist Rate</th>
<th>30% of Nyquist Rate</th>
<th>20% of Nyquist Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.3</td>
<td>14.6</td>
<td>12.2</td>
<td>9.7</td>
<td>7.3</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Table II. Global IP Traffic Projection for 2018 (EB/Month)

<table>
<thead>
<tr>
<th>Nyquist Rate</th>
<th>60% of Nyquist Rate</th>
<th>50% of Nyquist Rate</th>
<th>40% of Nyquist Rate</th>
<th>30% of Nyquist Rate</th>
<th>20% of Nyquist Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>131.6</td>
<td>79.0</td>
<td>65.8</td>
<td>52.6</td>
<td>39.5</td>
<td>26.3</td>
</tr>
</tbody>
</table>

Global Mobile Data Traffic Projection (In Exabytes) per Month for 2019 with the application of Compressive Sensing is projected and shown in table I. Global IP Traffic Projection (In Exabytes) per Month for 2018 with the application of Compressive Sensing is estimated and shown in table II. From these tables, it is evident that if we use compressive sensing with a sampling ratio of 20% of the Nyquist rate, we can reduce the global mobile data traffic and global IP traffic approximately to 1/5th of the expected volume with Nyquist Sampling.

Besides enabling sub-Nyquist measurement, Compressive Sensing possesses a lot of unique advantages. Compressive Sensing measurements are universal and the same random matrix works simultaneously with many sparsifying bases with high probability. Here we don’t require any knowledge of the tinges of the data being picked up. Compressive Sensing is robust in that the measurements have equal priority due to the incoherent nature of the measurements, contrasting to the Fourier or wavelet coefficients in a transform encoder. So if we lost one or more measurements, the whole reconstruction process will not be corrupted. This enables a gradually better reconstruction of the data as more measurements are acquired. Compressive Sensing places most of its computational complexity in the recovery system only, which normally will have more extensive computational resources when compared with the measurement system. So despite the conventional approach, the novel approach of the compressive sensing will support to deal with the challenges involved in Communication Networks with such high-dimensional and voluminous data for the sensor networks.

8. CONCLUSION

We are in the midst of an era of a digital revolution that is driving the development of modern types of high resolution sensing systems along with the information explosion. The amount of data generated by these systems has been rising in high speed. The traditional methods of reconstructing the signals from the measured data are based on Nyquist/Shannon sampling theorem. But, in most of the applications, the resulting Nyquist rate is enormous, which ends up with too many samples. Also it imposes so many constraints to the communication system as discussed above Compressive sensing is a new signal processing paradigm, which can be used to solve these limitations of traditional sampling for compressible signals. Thus compressive sensing can be applied for the reconstruction of sparse or compressible signals and can redue the sampling rates considerably providing power, hardware complexity, storage, communication and cost advantages for the system. Also most of the signals in nature are sparse in some domain. Hence by converting the signal into a suitable domain will increase the range of signals for which we can apply the technique of compressive sensing. So compressive sensing can play an effective role in managing the huge data associated with the sensor networks.

REFERENCES

ISSUES OF COPYRIGHT LAWS IN OPEN ACCESS RESOURCES:
WITH SPECIAL REFERENCE TO UNIVERSAL APPLICABILITY OF
CREATIVE COMMON LICENSES

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3Vikram University, Ujjain, India
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ABSTRACT
With the advent of computers and information and communication technologies, a number of conclaves were held for discussing better visualization of digitally format based research outputs. Internet and World Wide Web played a revolutionary role in faster movement of information around the world. Conclaves like Budapest (2003), Bethesda (2003) and Berlin (2003) considered and supported open access movement around the world. Open Access to scholarly literature birthed a new implementation of copyright issues in using open access resources. Hoorn (2006) analyses copyright issues in open access journals. Hoorn finds that most of the open access journals do not ask for copyrights over articles. Authors retain copyrights over their intellectual outputs. Even, where the copyright authorization is transferred to publishers of open access journals, the re-use of the work is prevented through copyright laws in favour of the aforesaid publisher. MIT Library mentions that open access do not reflect that the research output is beyond copyright sphere. Research works under gold open access and green open access are under copyright laws too. The paper gives emphasises over copyrights in various jurisdiction around the world to prevent intellectual rights. It would also emphasis over the fair dealing and fair use principles. The laws preventing digital right management would also be discussed to strengthen protection of digital contents. The paper primarily deals with explanation of developmental aspects and visualization of Creative Common Licences with support of previous studies and literature. The major objectives of the paper deal with the awareness of copyright laws, fair dealing principles and existence of copyright protection of intellectual assets of authors facilitating their research in open access but under Creative Common licences.

Keywords: Copyrights; Open Access Initiatives; Creative Commons

1. INTRODUCTION
Invention of printing machine and explosion of information resulted in formulation and adoption of copyright laws for preventing of rights of creators. Internet and World Wide Web enhanced the transfer of information from one place to another at a faster and cheapest way. Copyright right laws were preliminary designed with a view to serve protection of rights to authors for a certain period; however the clause of fair dealing or fair use was also included for the public good cause. The paper gives a brief development of copyright laws and copyright terms adopted under the laws of select countries. Fair dealing or fair use under specific jurisdictions has also been explained. With the advent of digital information, it has become very difficult to prevent digital born or digital form of information due to easiness of copying or transferring. Commercialization of research output of researchers is another factor which effects free use of information. A number of open access initiatives have also been adopted for wider accessibility of research outputs across the world. Introduction of Creative Common Licenses in 2002 have played a big role in protection of creative works even under public domain too. The article describes various creative common license in use for protection of creative work.

2. COPYRIGHT LAWS: CONCEPT AND HISTORICAL DEVELOPMENT
The requirement of copyright laws is a result of invention of Gutenberg’s Printing machine invented n 1439. It resulted in fast printing of books as compare to hand printing. The Queen Mary of England granted monopoly rights to Stationer’s Company on printing. It gave extraordinary powers to Stationer’s Company making profit out of intellectual assets of others. The first ever known law for protection of literary work is the Statute of Anne passed by British Parliament in 1710. This statute empowered the creators, authors and contributors to enjoy copyrights on their own work for fourteen years which could be renewed for next fourteen years too. Necessity of protection of intellectual rights were also framed in the Constitution of United States in 1787 under Article 1, Section 8 where the protection was granted to authors contributing scientific, literature and culture work. On the basis of such Constitutional provision, United States Copyrights Act was passed in 1790 with a protection of rights of authors and creators for fourteen years which could be renewed for next fourteen years. The term of protection of copyright were
extended from 14 years to 28 years with renewal option up to 14 more years under US Copyright Laws in 1831. Protection of Music (1831), dramatic composition (1856), photographs (1865) and works of arts (1870) were also included under copyright protection sphere in US Copyright Laws. During the time, Berne Copyright Conventions was held at Berne in 1886 to protect copyright laws at international level, which has been revised five times. Universal Copyright Convention was adopted by UNESCO in 1952 to formulate uniform copyright laws protecting intellectual rights at international level.

In 20th Century almost all major countries adopted copyright laws separately or under intellectual property laws. The terms of copyrighted work as adopted by select countries are given in table 1 for giving overview of protection period under various jurisdictions.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Name of the Country</th>
<th>Copyright Instrument</th>
<th>Copyright Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Australia</td>
<td>Australia Copyright Act, 1968</td>
<td>Life + 70 Years (If death before 1955 Life + 50 years.)</td>
</tr>
<tr>
<td>2.</td>
<td>Brazil</td>
<td>Law on Copyright and Neighbouring Rights), 1998</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>3.</td>
<td>Canada</td>
<td>Copyright Act 1985</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>5.</td>
<td>Germany</td>
<td>Law on Copyright and Neighbouring Rights, 1966</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>6.</td>
<td>Hong Kong</td>
<td>Copyright Ordinance 1997</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>7.</td>
<td>India</td>
<td>Indian Copyright Act 1957</td>
<td>Life + 60 Years</td>
</tr>
<tr>
<td>8.</td>
<td>Italy</td>
<td>Copyright Act 1941</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>9.</td>
<td>Japan</td>
<td>Copyright Act 1970</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>10.</td>
<td>Nepal</td>
<td>Copyright Act 1994</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>11.</td>
<td>New Zealand</td>
<td>Copyright Act, 1994</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>12.</td>
<td>Oman</td>
<td>The Protection of Copyright and Neighbouring Rights, 2008</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>13.</td>
<td>Pakistan</td>
<td>Copyright Ordinance 1962</td>
<td>Life + 50 Years</td>
</tr>
<tr>
<td>14.</td>
<td>Russia</td>
<td>Copyright and Neighbouring Rights, 1993</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>15.</td>
<td>Spain</td>
<td>Intellectual Property Rights Act 1996</td>
<td>Life + 70 Years</td>
</tr>
<tr>
<td>17.</td>
<td>United States of America</td>
<td>United States Copyright Act 1976</td>
<td>Life + 70 Years</td>
</tr>
</tbody>
</table>

3. COPYRIGHT LAWS AND FAIR USE PRINCIPLES

Fair use or fair dealing is a term under copyright law used as exception or relaxation of use of copyrighted work for benefit of the society. These are treated as such privileges enjoyed by researchers, scholars, scientists, educationists and students for the development of society. Copyright laws of almost all countries have a provision for fair use or fair dealing of copyright work. Australian Copyright Act 1968 under section 40 provides exceptions to use of copyrighted material for research and study, reviewing, news reporting and legal advice. Canadian copyright Act 1985 under clause 11, supports fair dealing principles for research and private study, review, critical evaluation, news reporting and parody. In India, Indian Copyright Act 1957 under section 52 facilitates exceptions for use of copyrighted works for criticism and review, news reporting, research and education activities. Copyright, design and patent Act, 1988 of United Kingdom under section 29, 30 and 178 finds application for fair dealing principles for private studies, research activities for non-commercial use, criticizing, evaluating, reviewing, quoting and reporting of news. In United States fair dealing principles are known as fair use. Section 17 of United States Code 106 and 106A states the applicability of fair use for copyrighted material for non-commercial educational and research purpose, quantum of copyrighted work used out of total work and the market value and term of copyrighted work.

4. CREATIVE COMMONS: CONCEPT AND DEVELOPMENT

In general ‘Creative Commons, or CC is a not for making organization established in 2001 by efforts and supports of Centre for the Public Domain for visualizing public domain open access resources. Creative Commons issued its first creative commons license in 2002 enriching with copyright conditions supporting availability and protection of intellectual assets along with open accessibility of such resources. The major aim to create creative commons licences is to protect intellectual work under public domain with minimum legal, technical and social barriers to share and re-use of information useful for education and research. Creative Commons was adopted by more than 1
Akash et al.

Creative Commons has created six levels of Creative Commons licenses as per given table

<table>
<thead>
<tr>
<th>S.N.</th>
<th>License Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Attribution CC BY</td>
<td>The first License with “Attribution CC BY” shows the literary work under this license can be used to distribution, remixing, tweaking and reusing for own work for commercial as well as non-commercial use with proper credit. This license gives most rights to users to use the others’ work under public domain.</td>
</tr>
<tr>
<td>2.</td>
<td>Attribution-ShareAlike OR CC BY-SA</td>
<td>The second License with “Attribution-ShareAlike OR CC BY-SA” stands for a licence having all attributes like distribution, remixing, tweaking and reusing for own work for commercial as well as non-commercial use, but the work may be treated as copyleft and a new License or copyright may be arisen after reuse or modification of such work for example the scholarly work under Wikipedia may be used as copyleft.</td>
</tr>
<tr>
<td>3.</td>
<td>Attribution-NoDrivs OR CC BY-ND</td>
<td>The third License with “Attribution-NoDrivs OR CC BY-ND” allows redistributing of work protected under the license for both commercial and non-commercial use as in its original formats with proper credit to creator(s) or contributor(s).</td>
</tr>
<tr>
<td>4.</td>
<td>Attribution-Non Commercial OR CC BY-NC</td>
<td>The fourth License with “Attribution-Non Commercial OR CC BY-NC” permits the use of work under public domain for distribution, remixing tweaking and reuse for personal work for strictly for non-commercial use. However, the creation of new work using such protected work has also obligation for not to use for commercial purpose with proper citation.</td>
</tr>
<tr>
<td>5.</td>
<td>Attribution-NonCommercial-ShareAlike or CC BY-NC-SA</td>
<td>The fifth License “Attribution-NonCommercial-ShareAlike or CC BY-NC-SA” protects the rights of owner of work where the users are permitted to remixing, tweaking and reuse to build their own work but strictly for non-commercial use. The creation or progressive work with reference to protected work is also required to use for non-commercial use with same set of license.</td>
</tr>
<tr>
<td>6.</td>
<td>Attribution-NonCommercial-NoDerivs OR CC BY-NC-ND</td>
<td>The sixth and last License ”Attribution-NonCommercial-NoDerivs OR CC BY-NC-ND” refers the protection of literary work in most restrictive sense. This license permits users to only downloading and sharing of protected work with proper credit but not permitting to change or alter for any commercial or non-commercial purpose.</td>
</tr>
</tbody>
</table>

5. COPYRIGHT UNDER CREATIVE COMMON LICENCES

Corbella (2015) elaborates that how a creator can protect and aware about safety of his or her creation. She describes European Directives of the European Parliament for protecting intellectual rights of information society. She explains facts under Spanish Copyright laws protecting rights of authors for making available their work in public or claiming authorship of the work and dignity. Corbella has explained copyrights along with explanation of economic rights of the authors. She explains creative common licenses mostly used for blogs and public domain websites for providing flexibility in use of such works with permission of the creators or authors. She observes that under creative common licenses, the authors or creators can pick and choose the limits of rights which they are agreed to share with potential users. She gives examples of CC BY 4.0 where a creator agrees to use his or her work for commercial and non-commercial purpose with proper credentials to original creator(s).

Kim (2008) performs a study on creative commons and copyright protection in the digital era. He assumes that the conflict of copyright laws may be decrease with involvement of creative common licenses. He starts with his study with two types of vision i.e. private property and public policy vision. He justifies that private property includes the work created or generated by the original author for which he or she has full right to enjoy. On the other hand he explains public policy vision over the copyrighted work under fair use doctrine. He finds that the restrictive practice of copyright laws may be harmful for future innovation and may block the progress of developmental in social as well as scientific sense. He includes content analysis of creative common licensed works, web based survey of creative commons licensors, characteristically sketch of creative common licensors, importance of creative commons licenses in financial profit as compare to copyright works and producing creative works and its relation...
with creative common licenses. He concludes his study with the findings that creative common licenses serve the dual purpose of protecting rights of creators and also provides access of advanced creative works to general public with certain rights.

Klimpel (2008) explains about open contents and protection and distribution of open contents by help of creative commons licensing. He describes different types of creative commons licences and its usefulness over non-commercial usage of open content. He further explains the commercial use of open content and what type of creative common licenses are used by Wikimedia. Under his study, consequences, risks and side-effects of the license module “non-commercial use only-NC”, he elaborates that non-commercial module of creative common licences are not used in Wikimedia, however it uses creative commons by ShareAlike module, which can be used by commercial players also.

6. CONCLUSION

Most of the research activities are supported by public funded money. Governmental and institutional research organizations contribute a big amount of research output. The information resulted from such organizations must be provided to general public under open access. On the other side, authors and contributors of creative works get very less financial benefits as compare to commercial players. Most of the institutions and independent content contributors and creators now prefer to provide their creative works in public domain. Creative common licenses are the only options for protection of copyright right in the regime of open access. On the choice or mind set of the content creator, Creative Commons provides six types of licenses. Creative Common licenses are the best option for combining the protection widely open accessibility of their creative works. Here the duty of librarians and information professionals come to educate end users to select and apply best appropriate creative common licenses for preserving their rights along with assibilate of their research work in public domain.

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REDEFINING POLICY FOR ACQUISITION OF E-RESOURCES IN LIBRARIES

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ABSTRACT
During the last two decades, the world has witnessed a drastic change in the way people seek and gather information. The key factor that has influenced the process of seeking and gathering information is the advancement in Information, Communication and Technology (ICT). As the use of ICT for accessing information has completely transformed the way researchers seek, acquire, store, disseminate and preserve information, it is important for the librarians and knowledge managers to adapt to the newer technologies for meeting the challenges being faced by information seekers. Considering the users’ preference to electronic information, the migration from print to electronic resources has become a top priority for Indian academic institutions. However, moving to electronic platform has a large number of critical issues and challenges. The issues may relate to different expectations of different library users, pricing of databases and services, access models, pricing, terms and conditions, licensing, sustainability, usage, information literacy, etc. An attempt has been made to highlight few major issues and the solutions to overcome the same. The paper also briefly discusses how Indian Institute of Management Indore shifted its collection from print to electronic resources over the last ten years.

Keywords: Electronic Resources, Subscription to E-resources, Acquisition of E-Resources

1. INTRODUCTION
Following graph reflect how IIM Indore moved from print to electronic resources and the amount it spent on electronic and print resources during 2005-2015.

Through this paper, an attempt has been made to spread awareness among librarians and information managers of the possible issues involved in the subscription of e-resources. With a mission to ensure that the selection and acquisition of e-resources are done to support the teaching, learning, research, training and consulting needs of the students, faculty, administration and staff, the paper aims at serving as a reference point for libraries for assessing and acquiring e-resources.

Some of the types of e-resources have been classified as under (Johnson et al., 2012):

- E-journals
- E-books
- Full-text (aggregated) databases
- Indexing and abstracting databases
- E-audio/visual resources
- Reference databases (biographies, dictionaries, directories, encyclopaedias, etc.)
- Numeric and statistical databases
- E-image
In the absence of collection development policy, the librarian has to develop a policy for his organisation in consultation with all its stakeholders by inviting their suggestions and inputs. In case a collection development policy already exists, the same needs to be reviewed, if required. The policy should clearly define the format related issues and should be able to provide clear direction concerning hardware/software compatibility, access platform, integration of different library applications, etc. Before initiating the selection process, it is crucial to understand and analyse the preference of the end users about various resources planned to be subscribed for them. For example, the user community may still prefer to read a printed copy over electronic content for some resources whereas their preference of reading would be entirely different for other types of content. Moreover, different types of users may have different reading preferences (Parvez, 2012).

The broader issues involved in e-subscription are listed below:

1. Content Selection
2. Pricing of Databases and Services
3. Terms and Conditions/Licensing
4. Compatibility: Browser, Existing Applications/Software
5. Vendor Support
6. Renewal

2. CONTENT SELECTION

Though the fundamental principles of traditional collection development criteria apply to e-resources also, there is a need to have a supplementary policy because of the growing number of e-resources being acquired in libraries today. The challenges of acquiring e-resources are more complex than what we witnessed while acquiring print resources in the past. The policy should be able to guide the acquisition librarians in terms of availability of e-resources on various platforms, functionality, support from the vendor/publisher, and most importantly, the complex licensing issues like purchase model, governing laws, access, unauthorised use, termination of contract, etc.

3. PRICING OF DATABASES AND SERVICES

In the context of Indian libraries, it has been observed that unlike print resources, there is a lack of uniformity in prices of databases and services sold by publishers/vendors. This poses a serious challenge for the librarians who struggle getting the best price for their libraries. In one of the recent cases witnessed by few premier institutions of the country, it was observed that the price difference of a product subscribed by these institutions was enormous. Justifying such anomaly, few publishers claim that it is primarily due to different subscription services, content and models the publishers have for different types of libraries.

In an attempt to ensure uniformity of the prices, IIMs have recently taken an informal decision of disclosing prices of all the subscribed products among themselves. Hence, it is suggested that before subscribing to any product, the acquisition libraries must check the prices with peer institutions.

4. LICENSING/TERMS AND CONDITIONS

This is probably the most important and complex issue in subscribing to e-resources. In the case of print resources that are bought outright, the standard copyright laws of different countries would prevail. Whereas, subscribing to e-resources requires the librarians to enter into a licensing agreement with the publisher. It is suggested that the libraries should develop a model licensing agreement that explicitly defines the rights of the library for the use of such products. At the same time, the librarians are expected to ensure (to the extent possible) that publishers rights are protected, and adequate measures are taken for creating awareness about prevalent copyright/IPR norms in the respective institutions.

Some of the important aspects of licensing agreement include issues related to access, users, content, ILL, renewals, etc. Some of the major points have been discussed below.

Access

The Acquisition Librarian needs to ensure that necessary attention has been paid to the following points concerning the accessibility to subscribed resources:

- User Id or IP Based
- Number of Users (Concurrent Users)
- Remote Access
- Location Restriction
- Remote Access

- Archiving and Perpetual Access
- Maintenance fee
- Downtime
- Currency of data

Depending on the usage or number of users in an organisation, the librarian may decide to choose the access model (user id/password or IP-Based access). However, it is advisable to go for IP-based access as one should not expect the users to remember all the passwords to access different databases. Similarly, one has to decide on the concurrent users who can access the database at a given point in time. With regard to the remote access,
it has been observed that till very recently, the publishers did not encourage such access. However, the librarians could succeed in obtaining rights that allow remote access using a secure access mechanism. Similarly, the publishers should allow access to their services both, from within the premises of the institute and outside its four walls. It is very surprising that even now, we find agreements restricting the user to access the content within the boundaries of the licensee.

Electronic books purchase is a tricky issue for librarians due to various reasons involved in the access of e-books. Some publishers do not allow to choose books of our choice or allow it only when a library agrees to purchase e-books of a minimum value prescribed by the publisher. Similarly, buying e-books directly from publishers have the advantage of no DRM but the ease of access may not be as good as when you buy from aggregators (EBSCO, Proquest, etc.). However, publishers provide multiple access whereas there are restrictions on the number of concurrent users while buying from the aggregators. Though most of the publishers’ sites allow you to download books chapter-wise, they do not have the facility of downloading the whole book as a single file. The feature of using/reading books offline is also not available with most of the publishers. On the other hand, though the offline download is available with the aggregators for a particular number of days (as decided by the library), there is a limitation (depending on the purchase model) on the number of concurrent users. In addition to various functionality and features, one of the most important feature provided by the aggregators is the ease of access in reading and maintaining a record of e-books.

Whether a library should buy e-books from publisher or aggregators, the decision lies with the individual library in view of their local needs. However, each library should device its guidelines in respect of such purchases. There must not be any compromise on archiving or continued access of content for which the licensee has paid the subscription cost.

**Users**

The term ‘users’ has been redefined as ‘authorised users’ and ‘non-authorised users’ in almost all the licensing agreements. Librarians need to pay close attention to the definition of authorised users so as to enable the majority of his/her users to access these resources. In the absence of explicit definition of users or authorised users, some of the library users may be deprived of accessing resources subscribed by their libraries. (Patnaik, 2014) suggests that a pre-purchased negotiation is essential to widen the definition of categories of users within the ‘authorised users’, such as walk-in users, employees, contractual, part-time students and staff, and workshop/seminar/conference participants.

**Downloading Rights**

Right to copy, download, print and save have to be clearly defined in the licensing agreement. It is advisable that the librarian should not leave any scope for ambiguity that may become a matter of dispute in the future. It has been seen that the licensor uses the word reasonable download which does not provide clarity on download rights. However, any systematic download or downloading any content in entirety should not be permitted by the libraries.

**Using Content in Course Packs**

The publisher should not hesitate in allowing the libraries to include their content in the course packs prepared by the academic institutions. Publishers/licensor have generally been recommending that the web links should be provided for the relevant content in the course pack rather than putting the full-text of the content. In the absence of such a provision, the students and faculty would be deprived of their legitimate right of accessing content. Also, since the subscription cost is generally linked to the Full-time equivalent (FTEs) or number of students on campus/total number of students, etc., the librarians should negotiate hard for such rights at the time of placing subscription orders.

**Inter-library Loan**

The Inter-Library loan (ILL) has still not evolved sufficiently in the context of such rights that are granted to any academic institution. Though a library can’t depend on ILL for meeting user needs, it is a critical issue that libraries have to honour for the purpose of resource sharing. It has also been seen that analysis of ILL requests received by a library may act as a tool for collection development, especially buying back-files from publishers. A couple of ILL clauses are as under:

>The electronic form of the Content may be used as a source for Inter-Library Loan ("ILL") whereby articles can be printed, and these print copies can be delivered via postal mail, fax, or fax-based service to fulfill ILL requests from an academic, research, or other non-commercial libraries. Requests received from for-profit companies or directly from individuals may not be honored. ILL through secure electronic transmission, as demonstrated by the ARIEL and Prospero systems, is permitted. Files transmitted in this manner must carry copyright notices. Licensee agrees to fulfill ILL requests in compliance with the US Copyright regulations. The Licensee may supply to an Authorised User of another library within India, a single copy of an individual document being part of the Licensed Materials by post, fax or electronically (whereby the electronic file is deleted immediately after printing), for educational purposes.
5. COMPATIBILITY: BROWSER, EXISTING APPLICATIONS/SOFTWARE

Compatibility to various browsers and existing applications/software is an essential aspect to be looked into for subscription to e-resources.

6. VENDOR SUPPORT

Another key aspect of any licensing agreement is to ensure that necessary vendor support is available to the libraries. This may include training, technical support, statistical reporting about usage, etc., branding by customising the product page, provision for exporting MARC records wherever applicable, data security, etc.

7. RENEWALS

Though most of the publishers/aggregators do not insist on auto-renewal of subscriptions, there are agencies that ask for an advance notice of 90 days for terminating the subscription contract. One of the aggregator’s license agreements says:

This Subscription Agreement shall automatically renew for an additional period equal to that stated as "Contract Term" unless cancellation notification is received by XXXX in writing by registered mail from the Subscriber at least 90 days before the end of the current term.

Considering the kind of environment the librarians operate, it is not possible (in most of the cases) to anticipate if a product will be discontinued in the next subscription year. Hence, it may not be possible for librarians to serve a 90-day notice to such publishers/vendors. In few cases, it has also been seen that publishers are not flexible in making any change in the license agreement indicating that this is a standard licensing agreement that does not have scope for any change. In such a case, it is advisable to issue a separate termination notice at the time of placing the subscription order saying that the license agreement will stand terminated on the last day of the subscription period unless and until renewed by the licensee.

8. CONCLUSION

Issues involved in subscription to e-resources range from type of subscription and access platforms, rights of users for downloading of content and using the same for various purposes including course packs, termination of contract, user definition, governing law, compatibility with the existing applications and systems, to content usage. Since academic libraries subscribe to large number of e-resources, information literacy and content integration becomes integral part of librarianship. The libraries must make a serious effort to ensure that the users are able to access every content in the most convenient and user-friendly manner without wasting their time in figuring out the right resources for their use. Libraries that subscribe to a large number of resources may explore integrating their resources by the use of a discovery tool.

The issues related to user expectation, pricing of databases and services, access models, pricing, terms and conditions, licensing, copyright, sustainability, usage, information literacy, etc. pose several challenges in today’s era. Also, due to huge amount involved in subscription of resources and complexities in content delivery of online products, it is concluded that every library should devise a mechanism to deal with all such issues related to subscription of e-resources.

REFERENCES


KNOWLEDGE MANAGEMENT SYSTEM IN ACADEMIC LIBRARIES

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ABSTRACT

The fast growing world requires the ability to capture, manage, knowledge utilization, information in order to improve efficiency, better serve customers, manage the competition, and keep pace with never-ending changes. Knowledge management is an important means by which organization can better manage the information. Knowledge Management System refers to a system for managing knowledge in libraries, supporting creation, capture, storage and dissemination of information. The idea of a Knowledge Management System is to enable the library users to have ready access to the sources of information.

Keywords: Knowledge Management, Knowledge Management System, Academic Libraries

1. INTRODUCTION

With the increasing growth of information and technology mainly in the area of communications there are hefty pathways to access colossal amount of information. Data is information in a raw or unorganized form of symbols, alphabets and numbers. The organized form of data is known as information. This information becomes knowledge when it enters into the human brain. Again knowledge transforms into information when it is uttered and communicated to others. In today’s knowledge based environments, significant knowledge management has established appropriate management tools to flourish and nourish in the ever-changing global market. Knowledge management involves an array of performance used in an organization to capture, build, circulate and enable implementation of knowledge. Many libraries have resources dedicated to knowledge management often as a part of “information technology.” To save the library patron’s time, libraries provide services with available knowledge management systems. The librarians capture information, create knowledge and disseminate it to the required society. The ability to share knowledge, to develop ideas and to become more innovative is important for library and information science field. The sharing of knowledge is increased nowadays with the development of technology. Every library should have mechanisms to create knowledge and manage knowledge as an asset.

Adapting knowledge management systems in libraries may add value to provide enhancing knowledge to their patrons with their attractive services at the required time frame. It is a must for the academic librarians to be involved in knowledge management systems to provide services to their users. The Importance of Information Technology as promoter of knowledge management practice in organizations, and particularly in academic libraries, is confirmed by many library and information science researchers including Abell (2000), Maponya (2004), Rowley (2003), and White (2004).

2. KNOWLEDGE MANAGEMENT SYSTEM

Knowledge management system refers to a set of information systems applied to manage organizational knowledge. Knowledge management systems are Information Technology oriented systems, its support and develop the organizational practice of knowledge building, storage, retrieval, and dissemination. In the Knowledge management system, knowledge is information which is meaningfully organized, accumulated, and embedded in the context of creation and application. Knowledge management systems conveniently maintains explicit knowledge with the help to choose the apt tool in the information technology.

Knowledge Management Systems can contain a part of a knowledge Management proposal. The design of Knowledge Management System is to enable the users to have ready access to the library’s sources of information, and data. Sharing this information library wide can lead to more successful purpose and it could also guide to dreams for new and enhanced technological system.

Knowledge Management System is the most efficient and effective way to train and then educate the library patrons. A Knowledge Management System allows the librarians to train their users to access all their resources through online. This means that the library users do not have to be physically in the library to receive the latest information; they access their library virtually; they sit in their own place and receive the hottest information at their own desktop, lap or mobile devices. Knowledge Management System is a great alternative to the old fashioned methods of training and educating their patrons. It guides the users to access their own library at
‘anywhere’, ‘anytime’. In the evolution of information technology, libraries choose their own knowledge management systems to provide utmost service; the libraries are at the patron’s palm now a day. A knowledge management system provides the suite of various catalog courses, content management, reporting, online authoring, and simplicity of use in the library growth and changes. Libraries of various sizes have the ability to give their users the latest and greatest training available by using a knowledge management system. A knowledge management system is very flexible and it can be adjusted with the size of the company that is using the knowledge management system. Knowledge management system could be improved with new equipments. Libraries utilize the knowledge management system to create, manage and share the library resources through various database.

Davenport and Prusak(1998) their knowledge and its characteristics are more applicable for organizations, which intricate in learning activities as knowledge management systems, which helps obtain information from the knowledge repositories and capable to generate enhancing knowledge among the global environment. At present organizations are developed their knowledge with best knowledge management systems. Knowledge management systems are illustrated in numerous ways. Meso and Smith’s(2000) style is the preeminent one as shown in Figure 1, that contains three techniques such as technology, function and knowledge. This representation of Knowledge management System involves the process for acquiring, building, disseminating knowledge among patrons in the libraries.

**Fig. 1 The Technical Perspective Of A Knowledge Management System**

**Components of a Knowledge Management System:**

A knowledge management system, in its initial stages, can be broken into several subcomponents:

1. Repositories: Repositories hold explicated formal and informal knowledge, as well as the rules associated with them for accumulation, refining, managing, validating, maintain, contextualizing, and distributing content.

2. Collaborative Platforms: Collaborative platforms support distributed work and incorporate pioneers, skills database, expert locators and informal communications channels.

3. Networks: Both digital and social networks support communications and conversation. Digital networks are hard networks such as intranets, extranets, shared spaces, and supply chain networks. Social networks are soft networks such as communities of practice, industry-wide coalitions, and trade associations. We are not sorry to discuss networks in-depth here because we started with the assumption that your company already has network infrastructure in place.

4. Culture: Culture enable to encourage sharing and use of the above.
**Factors of Knowledge Management System:**

There are several factors for the successful implementation of a Knowledge management system. The technology must be accessible to everyone; training must be provided for its use; and above all, it must be used. Technology is essential for successful knowledge management; the literature also reveals that technology alone does not ensure a successful knowledge management system.

Another factor for a successful knowledge management system is content that is current and relevant. It is important to review and update the content, check for quality responses, and ensure that the responses provided were correct so that when similar or the same questions are asked accurate answers can be provided.

In addition to knowledge management tools must have a process that facilitates the use of the system. That is, the use of the system must be a natural part of the workflow. Many researchers have recognized this absence of integration as a critical factor that leads to the failure of the knowledge management tools.

**Use of Knowledge Management Tools:**

Using knowledge management tools does not seem to be a problem for the librarians. Librarians have used knowledge management tools consistently and effectively for years. One of the most obvious examples of practicing knowledge management in libraries is the use of shared cataloguing records through regional databases such as OCLC and RLIN, online catalogues. According to Patil(2013) knowledge management in libraries required to build up their resources access and disseminate knowledge from printed to electronic and digital resources.

In India, there are various knowledge management systems introduced to motivate the users to develop their knowledge in higher studies and researches. Libraries are performing as a bridge between the user and the knowledge management systems. UGC-INFONET, DELNET, NLIST are great knowledge management systems, which provide full text access of various books, journals and other materials for college and university students and staff members. The patrons are motivated by the librarians to conduct various orientations.

Social software tools are used in knowledge management. Social software tools such as blogging, micro blogging, social networking, social book marking, wiki, instant messaging, brainstorming, and discussion boards are available. Many libraries are using the above tools to create their own library websites to provide service to their users anywhere, anytime. Social media’s revolution has affected the library and information science. Many library blogs and websites are impact of social media. The libraries provide services through this media; they communicate with their information widely in the digital environment.

3. **CONCLUSION**

Knowledge Management systems play a vital role in the libraries to enhance the service with new technologies within the time frame. Librarians are fulfilling S. R. Ranganathan’s wish ‘Save the time of the Reader’ as true, librarians save their patron’s time and encourage them to access the library resources whenever and wherever they are. Librarians are preeminent knowledge creators in the fast growing Information and Communication technology world.

**BIBLIOGRAPHIES**

SMART LIBRARY FOR THE NEW GENERATION WITH MOOCS AND OER FACILITY

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ABSTRACT

Providing the best quality library services is one of the thrusts of libraries not only in Oman but worldwide. As the number of library users is increasing leading to wider demands and needs, new ideas and tools are enhanced to be able to support knowledge and capabilities. With the understanding of how new generations can learn and improve with the use of libraries, the concept of MOOCs facility as a strategic opportunity was introduced. In exploring such emerging technologies, which develop open learning experience has created an opportunity for an open participatory environment.

It has been a fact that Massive Open Online Courses (MOOCs) has not only influenced society but also higher education as well. It has impacted how courses are delivered globally which has apparently influenced academic support services like libraries in a greater aspect. Such interest in MOOCs and OER has widened the perspective that libraries can play a big role in the area of education.

This paper aims to introduce the applications of a smart library and its uniqueness that will serve the whole society and facilitate learning through MOOCs and other Open Educational Resources (OER). Smart libraries have become popular because of the many advantages it could offer to the learning communities which become more appealing to librarians in academic and public libraries as well as the new wave of knowledge workers. It will discuss the role smart libraries play in the development of MOOCs and other OER facilities. The smart library systems architecture model will also be presented with a leverage of virtual technology.

Keywords: MOOCs, LIS, Open Educational Resources, Smart Library, Library Systems Architecture

1. INTRODUCTION

The advancement of information and communications technology led a ubiquitous environment where access to information anywhere and anytime was made easier. The use of SMART libraries is one integral part of the educational environment where accessing resources with the use of different information services is now more convenient to library users and the different learning communities.

On the other hand, technology is moving really very fast which makes books easily outdated. Indeed by the time a book is published, another book is on process for its final review and later for publication and distribution. SMART libraries promote research with the use of Information and Communications Technology (ICT) in different learning environments around the globe with the emergence Open Educational Resources (OER) and Massive Open Online Courses (MOOCs).

This study focuses on the involvement of a library system as an organizational unit in the community of learners, of individual librarians, information science specialists and the use of smart technology in implementing OER and MOOCs. It answers the questions: 1) What is the role of smart libraries in the development of MOOCs and other OER facilities? 2) What is the recommended architectural design appropriate for SMART libraries using MOOCs and OER facility?

The study is a mix of literature review and studies discussing the characteristics of smart libraries, MOOCs and OER; their advantages and relevance on higher education and the challenges, opportunities and impact of MOOCs on academic smart libraries.

2. LITERATURE REVIEW

The smart library technology has equipped libraries with thorough and searchable list of resources to be able to connect to library users and the learning communities by providing the access to an online system. This change has led into the utilization of a smart, safe and responsible use of technology.

(http://www.esmartlibraries.org.au/Pages/WhatIseeSmartLibraries.aspx)
Moon, et. al (2014) said that smart library systems can achieve seamless integration of the information technology that will bring the rich knowledge into the library. In their paper, the authors presented a reference framework of smart library systems which consists of 4 layers: resource core, layer core, service layer and delivery layer. Their concept was based on an innovative information technology such as cloud computing, ubiquitous computing, mobile computing, linked data and Big Data. This migration of traditional approach has been successfully accomplished in various ways.

The paper has analyzed the different functional requirements of a smart library system by considering what are demanded by the users as well as the eco-system of information technology. A framework was proposed to accommodate the functional requirements and provide smart knowledge services to users in the global environment.

**MOOCs**

**Development of MOOCs in the Academic Community**

In the study of Chen (2013), it was mentioned that the academic community has increased openness. Openness in the sharing of knowledge to be able to fill the missing gaps breaking academic barriers which was gradually applied in self-archiving, Open Access, Open Educational Resources (OER), Open Scholar, Open CourseWare (OCW), etc. The collaboration and sharing has led to new models in scholarly communication which made it possible to engage everyone in learning at the university level.

**Libraries and MOOCs**

The librarians started opening its doors to an emerging open education movement in 2009. This has begun during the 2009 ACRL/SPARC forum at an ALA Midwinter meeting were Open Educational Resource advocates had spoken about OER and the roles libraries could play in supporting them (SPARC & ACRL, 2009). This was regarded as a vital professional issue with the emergence of Massive Open Online Courses (MOOCs) in 2011. Since then, it was regarded an important topic in the professional literature where MOOCs has been included when library support is discussed.

Almeida (2013) in her article discussed that MOOCs have gained power upon succeeding in unmooring educational exchanges and setting them adrift in the sea of the internet. It was also presented that although the MOOC is a new platform; it has overturned the educational sector in which librarians have heavily invested including intellectual property, digital preservation and information delivery and curricular support model. Librarians have used MOOC as an opportunity and strategy to change.

In addition, it was mentioned by Almeida (2013) that –in spite of the spectrum of perspectives, variety of MOOC incarnations, and the fact that the legitimacy of a MOOC (essentially a scalable curricular support tool) as a true transformative technological phenomenon is debatable, MOOCs still deserve another look. Here’s why: the exploration of the MOOC as catalyst for critical inquiry—a kind of operant—may offer some perspective on why higher education is changing and how librarians can play an active role in shaping what higher education becomes.

However, he emphasized that MOOCs are not so different from other historical pedagogical innovations and are not so different from other historical pedagogical innovations. In fact, –a MOOC isn’t a thing at all, just a methodological approach [and arguably, an emerging business model], with no inherent value except insofar as it’s being used! (Stommel, 2012).

Open Access (OA) is no longer a new concept in the tertiary level. From its transition from its introduction to implementation, it has received high resistances from academicians and institutions. In his book Open Access, Peter Suber (2012) said that –failure of imagination! is the main obstacle into its adoption. People do not understand how to pay for it, how to support peer review, how to avoid copyright infringement, how to avoid violating academic freedom, or how to answer many other long-answered objections and misunderstandings.

Butler (2012) then emphasized that the new pedagogical context of a MOOC prompted institutions to develop –a new strategy of adopting carefully crafted open access policies. Librarians are the primary drivers behind initiative of providing OA support, educating faculty about OA resources and by negotiating license terms with toll- access publishers. Whenever possible, libraries should engage in conversations around MOOCs and promote their core values. By doing so, they promote the continuing vitality of libraries as partners in the educational system.

Chung (2015) in his article, mentioned about three (3) missions to create a synergy between libraries and MOOCS. These are the following: -1) To foster community – libraries are places that attract people from the community, 2) To increase access – not at all of the public are able to take advantage of technology equally, and one of the roles of libraries is to help those who need more assistance with technology; 3) Provide learning opportunities – libraries have traditionally been places for people to learn, whether it is for students, adults exploring new interests, or
career-seekers. The author emphasised that these goals have potential synergy with MOOCs and that libraries have to offer their best resources and depend on MOOCs as great source of content. (https://www.class-central.com/report/libraries-and-moocs/)

Hyperlinked Library MOOC

The San Jose State University in California has offered the Hyperlinked Library MOOC which provides a roadmap toward becoming a participatory, interactive, user-centered library. The course examines various participatory theories of library service, the impact of emerging technologies and libraries and the growing focus on a creation/curation culture. The different participatory services were explored, the impact of the Hyperlinked Library model were also examined. Having such course will prepare and welcome the students to the environment of Libraries and MOOCs. (http://ischool.sjsu.edu/programs/moocs/hyperlinked-library-mooc)

Open Educational Resources (OER)

OER is a term that was first adopted at UNESCO’s 2002 forum. OER is possibly defined as digitized materials offered freely and openly for educators, students, and self-learners to use and reuse for research, teaching and learning. The idea of OER aimed at giving students equal access to knowledge, relevant and rigorous educational resources and innovative educational opportunities.

Caswell (2012) stated in his study that an initiative to redesign their curriculum was undertaken by the Washington State Board of Community and Technical Colleges to leverage OER and original, faculty-authored content. In this way, the faculty will be able to use OER in order to replace traditional textbooks and will dramatically lower the cost of education.

3. DISCUSSION

The Role of SMART Libraries in the Development of MOOCs and OER Facility

In her study Kazakoff-Lane (2014) said that libraries can and should support open education. This is in support for access to information that will aid in teaching and research as well as the professional obligations of librarians to foster continuing education. It is important to understand that open education movement that includes OER and MOOCs and how libraries help address these challenges. As a holistic approach, libraries can support this movement in order to facilitate universal, affordable and quality education.

There are few studies assessing the involvement and support of libraries in OER initiatives, the different activities involved and how important these activities are to OER projects.

Advantages SMART Libraries Could Offer to the Learning Communities

MOOCs and OER create global learning communities that will benefit library patrons, institutions and other members of the learning communities which give challenges and opportunities for academic libraries such as the application of a SMART library architecture. Librarians then have to be involved in the MOOC movement to be updated of the latest developments.

The goal of smart libraries is to leverage the trust of learning communities to be able to release secured and relevant information and make it more available to them anywhere and anytime.

MOOCs give opportunities to academic libraries to guide administrators, faculty and students on how this facility improve and change higher education. Librarians then should be able to understand the smart libraries and MOOCs landscape. The adoption of this technology with the purpose of managing monitoring MOOC usage and tightening internet safeguards is also essential. (http://er.educause.edu/articles/2013/11/libraries-in-the-time-of-mooocs)

SMART Libraries Using MOOCs and OER Facility Architecture Design

Moon et. al. (2014) in their study presented a reference framework of a SMART library which was composed of 4 layers: resource layer, core layer, service layer and delivery layer. The resource layer managed 3 major resources of library systems and the prominent properties of these resources had supported semantic interoperability and reuse. The functional requirements of the smart library systems were summarized into four (4) categories such as Knowledge Resource Network, Library Social Network, Smart Service Network and Technology Network.

This referential architecture was applied in this study. The whole concept was exploited to show the full view of a SMART Library within the operation of OER and MOOCs. Implementing a repository or a content management for OER and MOOCs will be facilitated using the smart library system architecture.
There are a number of libraries involved in OER and MOOCs. In 2010 a survey was conducted by the Centre for Educational Technology, Interoperability, and Standards (CETIS) in 2010. The data revealed that in 3 out of 4 times, the library played a leading role in many OER initiatives (Bueno-de-la-Fuente, Robertson & Boon, 2012, pp. 6–7) and that most respondents (61%) considered the library’s contributions to be indispensable or very valuable, with an additional 23% viewing library involvement as valuable (Bueno-de-la-Fuente et al., 2012, p. 37).

![Figure 1-SMART Library with MOOCS and OER Facility Architecture Model](image)

The survey indicated that the main areas of library involvement were description, classification, management, preservation, dissemination, and promotion, with some involvement in intellectual property and licensing rights, discovery of OERs, evaluation of OERs, use of OERs in teaching, and the creation or repurposing of OERs, but that in many instances, librarians needed to develop expertise in other areas, such as search engine optimization, e-learning, and OER knowledge (Bueno-de-la-Fuente et al., 2012, p. 7).

4. CONCLUSION AND FURTHER STUDIES

With the MOOC and OER movement, academic libraries need to engage more in such an endeavour and play a vital role in contributing toward increased participation towards OER and MOOC application. The OER and MOOC initiatives promote a more sustainable knowledgeable society. Further studies have to be conducted in order to evaluate the effectiveness and efficacy of smart libraries with the MOOCs and OER facility. The impact of this application in terms of its sustainability and further exploration has to be extensively reviewed and evaluated.
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MEASURING WEB BASED LEARNING: A STUDY ON LIS STUDENTS IN BHARATHIDASAN AS AN UNIVERSITY

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ABSTRACT
The advancement in Information and Communication Technology (ICT) has brought phenomenal changes in the field of education. In the present era, people who are seeking lifelong education have enhanced enormously. As a result, the educational institutions now a days have been forced to discover new methods of teaching in order to impart education to these mass learners. To overcome this problem, most of the educational institutions are providing web based courses through Virtual Learning Environment (VLE). In web based learning, the teaching and learning process is done using electronic media or other computer network in order to give the material to the students. In order to deliver the material, Learning Management System (LMS) will be used, which is an e-learning infrastructure with the functions of delivering the courses, supporting collaborations, assessing learners’ performance, recording learner data and generating reports to maximize the effectiveness of the entire learning organization. Since, abundance of information is available on the web, organization of content becomes difficult and the needs of the target group is essential in order to be successful. in Bharathidasan University towards creating the course content for web based learning. Survey method was adopted in this study and questionnaire was distributed to collect data from the students and the data was analyzed using various statistical tools.

Keywords: ICT, LIS Students, Web based learning, LMS, VLE

1. INTRODUCTION
The developments of Information and Communication Technologies (ICT) have brought Psychological, Sociological as well as Technological changes in the field of education. In the present scenario, the number of people who are seeking education, skill enhancement or lifelong learning has increased tremendously. This has forced the educational institutions to find new ways and means to impart education to mass learners. The development and innovations in Information technology such as computer and internet have enabled various educational institutions to overcome this problem by delivering web based courses via virtual learning environments (VLE). Many Institutions have started to employ e-learning, which has the goal of learning anytime and from any place (Barjis, 2003, P.4). E-learning could be interpreted as electronic learning, in which teaching and learning process is done by using internet media, intranet or other computer network in order to give the material to the students (Darin E.Hartle (2001). Learning management system (LMS) which is also known as virtual learning environment, is an e-learning infrastructure with the functions of delivering the courses, supporting collaborations, assessing learners’ performance, recording learner data and generating reports to maximize the effectiveness of the entire learning organization. This paper assesses the need of the LIS students for creating the course content in web based learning.

2. OBJECTIVES
The following objectives were framed for the present study:

- To find out the method of course content preparation
- To identify the order of learning objectives to be written for the course content
- To identify the mode of presentation of the course content
- To find out the kind of course for which content to be prepared
- To identify the evaluation model required
- To find out the preference of evaluation to be conducted
- To identify the type of feedback preferred by LIS students

3. METHODOLOGY
The target group of the study is students of Library and Information science from Bharathidasan University. The study adopted a survey method and structured questionnaire was prepared. The questionnaire was given to MLISc, M.Phil and Ph.D students of Bharathidasan University. A total of 50 questionnaires were issued to the students and
all the students returned their questionnaire. Further the data was tabulated and analyzed using a three point scale namely Highly Preferred (HP), Moderately Preferred (MP) and No Preference (NP).

4. ANALYSIS
The collected data was analyzed in tabulation form and three point scale was applied to test the objectives of the study.

4.1. Preference of Course Content Preparation

Table 1: Preference of course content preparation

<table>
<thead>
<tr>
<th>S.NO</th>
<th>PREFERENCE</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topic wise precise information</td>
<td>7 (14%)</td>
<td>14(20%)</td>
<td>29(58%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>Only core points underlying main topic</td>
<td>28(56%)</td>
<td>19(38%)</td>
<td>3(06%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>Detailed Explanation only</td>
<td>23(46%)</td>
<td>20(40%)</td>
<td>7(14%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>4</td>
<td>Explanation with examples</td>
<td>35(70%)</td>
<td>12(24%)</td>
<td>3(06%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 1 presents the preference of course content preparation for web based learning. It is clearly seen from the table that 70% of the students highly preferred explanation with examples while preparing the course content for web based learning and it is followed by only core points underlying main topic.

4.2. Order of Learning Objectives

Table 2: Order of learning objectives to be written for the course content

<table>
<thead>
<tr>
<th>S.NO</th>
<th>ORDER OF PREFERENCE</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course content for the whole</td>
<td>1 (2%)</td>
<td>8(16%)</td>
<td>41(82%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>For each unit</td>
<td>28(56%)</td>
<td>17(34%)</td>
<td>5(10%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>For each topic</td>
<td>33(66%)</td>
<td>15(30%)</td>
<td>2(4%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>4</td>
<td>For each sub topic</td>
<td>21(42%)</td>
<td>24(48%)</td>
<td>5(10%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 2 depicts the Order of learning objectives to be written for the course content. It is inferred from the table that 66% of the LIS students highly preferred that the learning objectives to be written for web based learning for each topic. It is also revealed that 82% of the LIS students do not prefer writing learning objective for whole course content.

4.3. Mode of Presentation of the Course Content

Table 3: Mode of presentation of the course content

<table>
<thead>
<tr>
<th>S.NO</th>
<th>ORDER OF PREFERENCE</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Text Presentation</td>
<td>18(36%)</td>
<td>10(20%)</td>
<td>22(44%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>Video Lectures</td>
<td>25(50%)</td>
<td>22(44%)</td>
<td>3(6%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>Lectures with Power</td>
<td>27(54%)</td>
<td>18(36%)</td>
<td>5(10%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>4</td>
<td>Video Lectures</td>
<td>39(78%)</td>
<td>7(14%)</td>
<td>4(8%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 3 presents the Mode of presentation of the course content for web based learning. It is clearly seen from the table 78% of the LIS students highly preferred to present the course content using Video lectures supplemented with PPT slides and hyperlinks and it is followed by Lectures with Power Point Slides.

4.4. Kind of Course Material Required

Table 4: Kind of course material required

<table>
<thead>
<tr>
<th>S.NO</th>
<th>COURSE MATERIAL</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>For Subject Syllabus</td>
<td>28(56%)</td>
<td>18(36%)</td>
<td>4(8%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>For NET/SET Exams</td>
<td>34(68%)</td>
<td>13(26%)</td>
<td>3(6%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>For Competitive</td>
<td>2(4%)</td>
<td>19(38%)</td>
<td>29(58%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 4 presents the kind of course material required for web based learning. It is clearly noticed from the table that 68% of the LIS students highly preferred to have web based course material for NET/SET examinations.
4.5. Type of Evaluation Model

Table 5: Type of Evaluation Model Required

<table>
<thead>
<tr>
<th>S.NO</th>
<th>COURSE MATERIAL</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quiz</td>
<td>32(64%)</td>
<td>11(22%)</td>
<td>7(14%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>Objective type of test</td>
<td>41(82%)</td>
<td>7(14%)</td>
<td>2(4%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>Subjective type of test</td>
<td>14(28%)</td>
<td>6(12%)</td>
<td>30(60%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>4</td>
<td>Assignments</td>
<td>16(32%)</td>
<td>6(12%)</td>
<td>28(56%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 5 shows the type of evaluation model required for web based learning. It reveals that 82% of the LIS students highly preferred Objective type of test. It is also noted that 56% of the LIS students do not prefer assignments.

4.6. Preference of Evaluation

Table 6: Preference of Evaluation to be conducted

<table>
<thead>
<tr>
<th>S.NO</th>
<th>TIME OF EVALUATION</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>At the end of the</td>
<td>12(24%)</td>
<td>7(14%)</td>
<td>31(62%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>At the end of each</td>
<td>37(74%)</td>
<td>10(20%)</td>
<td>3(6%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>At the end of each</td>
<td>32(64%)</td>
<td>12(24%)</td>
<td>6(12%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>4</td>
<td>At the end of each</td>
<td>11(22%)</td>
<td>29(58%)</td>
<td>10(20%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 6 analyzes the Preference of Evaluation to be conducted for web based learning. It is clearly seen form the table that 74% of LIS students highly preferred to have the test at the end of each unit and 62% of the students do not prefer test at the end of the course.

4.7. Type of Feedback

Table 7: Type of Feedback Preferred

<table>
<thead>
<tr>
<th>S.NO</th>
<th>TIME OF EVALUATION</th>
<th>HP</th>
<th>MP</th>
<th>NP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Individual Feedback</td>
<td>28(56%)</td>
<td>12(24%)</td>
<td>10(20%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>2</td>
<td>Blogs</td>
<td>22(44%)</td>
<td>20(40%)</td>
<td>8(16%)</td>
<td>50(100%)</td>
</tr>
<tr>
<td>3</td>
<td>Forums</td>
<td>20(40%)</td>
<td>24(48%)</td>
<td>6(12%)</td>
<td>50(100%)</td>
</tr>
</tbody>
</table>

Table 7 reveals that 56% of LIS students highly preferred to have individual feedback and other type feedback are also equally preferred by the students.

5. SUMMARY AND CONCLUSION

This study aimed at analyzing the need of LIS students in creating the course content towards web based learning in Bharathidasan University. The findings of the study revealed that 70% of the students highly preferred explanation with examples while preparing the course content for web based learning. In the Order of learning objectives to be written for the course content, it was found out that 66% of the LIS students highly preferred that the learning objectives to be written for web based learning for each topic. In the Mode of presentation of the course content, it was found out that 78% of the LIS students highly preferred to present the course content using Video lectures supplemented with PPT slides and hyperlinks. In the kind of course material required, it was found out that the LIS students highly preferred to have web based course material for NET/SET examinations. In assessing the type of evaluation model, it was found out that the LIS students highly preferred to have web based course material for NET/SET examinations. In the type of feedback preferred, majority of the students highly preferred to have individual feedback. In order to successful in implementing web based learning, the above suggestions given by the students will be taken into consideration while preparing the course content.

REFERENCES


CHANGING DIMENSIONS OF LIBRARIANSHIP AND LIBRARY SERVICES WITH DIGITAL CONTENT

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ABSTRACT

Library is a social institution committed with responsibility of collecting, organizing, preserving and disseminating knowledge. Due to phenomenal explosion in information at an exponential rate, there is a conceptual change in every walk of life. To access and utilize this enormous amount of distributed information scattered everywhere has become the major challenge today. Development in the information and communication technology has revolutionized the modes and methods of information storage and retrieval in information centres. The impact of information technology is visible in each and every activity of the library in today’s scenario. The journey of a document right from its planning, selection, monitoring, acquisition and technical processing is now becoming much more effective. There is hardly any function of the library where Information Technology has not shown its impact. The present paper discusses the changing dimensions of librarianship and the libraries in the 21st century as to how the changes can be sustained and embedded in practice. This paper is based on the observations and interviews with the library users of different libraries and the way they seek information for their business requirements and research and development activities in digital era.


1. INTRODUCTION

Librarian profession is regarded to be concerned with the principle and practice of selection, purchase, organisation, dissemination and providing access to information in accordance to the specific requirement of user group. Librarians have an art of organising knowledge sources in various forms and disseminate the knowledge to the right people at right time in right personal way. Librarianship in today’s digital era, demands much more attention and effort in connecting with users and maintaining the engaging with the users. Librarians are considered as mediator between the user and information which is scattered all around the globe.

As we all know that Library profession have an extensive past of adopting technology to extend the services to the user community. Professionals have changed rapidly and timely from using the then typewriters to the current internet and now adopting the Mobile technology smoothly as well. After getting into this virtual world library professionals is using the all available technology to provide the best access and services to their users. The digital library has brought revolutionary changes as well as challenges in the modern library management and in delivering the information to users. This has also affected the libraries from development and preservation to development and use of the resource centres. Gone are the days when libraries have only printed collections. The emerging technologies have compelled libraries to digitize and generate the information to its wider population. The advent of internet has radically changed the form of library classification and cataloguing as well. Digital accesses of materials have brought enormously powerful searching methods to the desktops of many researchers and they are the actual beneficiaries of this technological change.

2. INFORMATION LITERACY

ALA defined information literacy as “recognizing when information is needed, and having the ability to locate, evaluate and use this needed information effectively” (ALA 2010). In 2003, ALA developed this definition for setting up information literacy paradigms for the user learning. ALA has also recommended that information literacy should be made compulsory for all the users in the higher education institutions and other organisations. Users should be provided and oriented with the chance to learn not only how to access information sources but also how to appraise, manage, and utilize them efficiently and effectively. Information literacy is the basis for prolong learning which facilitates learners to master content and expand their investigations and explorations for becoming self-directed and presumptuous in controlling their themselves and or self-learning.

3. LIBRARY COLLECTION

In today’s digital scenario the libraries are changing in view of the rapid changes in the learning and research environment and changes in the behaviour of Library users (Denise A. Troll). The changes in the libraries not only becoming progressing and evolutionary by putting in latest digital resources and services but they are also sustaining...
their archives, traditional resources and services as well. In the same time these libraries are facing challenges for finding appropriate resources for users and also to get the funds for the maintaining the available resources. Hence the balances between digital and traditional initiatives are the foremost strategic and financial challenge for the policy makers of any institute.

4. **NEED OF PHYSICAL LIBRARIES AND LIBRARIANS IN DIGITAL ERA**

The initiation of the computers has created the requirement of libraries and it is also a fact that the librarians are under scrutiny. Everything that is in readable form is now available online. The question may arise then why physical libraries and librarians are required anymore? Answer is why not. !! Libraries are now becoming very important than increasing than it was before. They are becoming a place for any individual’s expansion of knowledge, innovation and development, Libraries are playing as a route-finder in the information age and they are the hub for community and cultural rendezvous and a dependence place for preservation of traditions. (Herrera, 2012) Over the last few decades libraries are keeping swiftness with the challenging and rapid changing technologies and enhancing the significance of its existence. The traditional bookstores are still learning to find a way in this digital period. Every year the decreasing number of population coming to the World book fairs is an example to this.

The question also may arise that why the users still go to the libraries for getting their reading materials? It is because library services are meant for the communities. Although we have automated certain services for the sake of convenience, but still it is felt that librarians are an integral part of libraries. Librarians are the key role players of a library and they are the mentors who enable access to information, regardless of the format. Today Libraries are not only just repositories of knowledge but are also houses for access the information. Libraries are providing the access to these resources to their patrons who cannot afford the technology driven equipments and in many cases the patrons feel comfortable bringing their laptops to the libraries to get peaceful environment. Many job applications are being filled up online and some libraries are providing free access to their members for using such service.

Technology is widening the digital infrastructure. Web-based content and electronic media is changing the dynamics of working culture of libraries and the modern libraries are operating and managing their mission utilizing the new digital resources. In current scenario, nearly more than 300 million users are utilizing the library services. Once, we called libraries as a peaceful center with books and reading areas with tables and chairs but now things have changed dramatically. The ambiance of a library is much different. Technology has now become an essential part of any library. In today’s scenario the percentage of libraries offering Wi-Fi and other services offered through computers and internet for their visitors is growing tremendously and this demand is encouraging more research, collaboration and study. In addition to this, libraries are offering online access to digital archives, circulation of e-books, music, videos, and audio books, and many more facilities. Online classes through open source softwares are also in great demand.

The American Library Association ([www.ala.org](http://www.ala.org)) supports the following 4 primary dimensions for strategic library development:

1. Physical To Virtual Libraries – Balancing between the physical and the digital materials and to create an equilibrium between the users and the materials
2. Individual To Community Libraries – Accepting the demand of users concerning with respect to public commitments
3. Collection To Creating Libraries – Transformation of libraries into facility providers for media establishments and not just utilization of space.
4. Portal To Archive Libraries – Balancing between physical materials and digital resources digital archiving.

5. **CHANGING ROLES OF LIBRARIANS IN DIGITAL ERA**

The responsibility of the information providers is increasing in terms of utilisation, covering and uncovering of the information. The wider publicity of usage of electronic resources, counselling the users about the policy to identify relevant electronic sources, etc. is in great demand. Librarians are required to update their skills pertinent to the technological advancement. In this new environment some of the library professionals find it difficult to decide that what and how to organise and cite the collection.

Thus it is emphasised that the librarians have to adapt the change and must be proactive in acquiring information literacy skills. They are required to play major role between technology and physical materials. Librarians and the staff are although overburdened due to the over load of work and other assignments being given time to time as stated by many librarians. But as a professional author feels it is because of the increasing and changing responsibilities and roles. Many library professional either do not have the requisite skills to perform their day to day task or their lack in getting or providing training to their support staff. They also lack in conducting required
Lata Suresh

research or to present the result effectively to their management or higher officials. In some of the libraries it was found that the competent staffs are missing.

The users today are demanding remote access for accessing the library resources that means they require unrestricted access of electronic collections and services. The library professional are in pressure because now things are changing. Previously, the students and faculty turned to libraries for getting the materials of their interest but now they are turning on to their personal computers whenever they require finding any information. Users are appreciating the expediency of the electronic resources. In the same time they also know that the best resources are still only available in print form. That is the reason that the inter-library loan and document delivery services are still viable in this digital age. In some institutes of higher learning like University of Birmingham where the author was a commonwealth professional fellow have seen the librarians involving themselves in developing web-based training materials and helping the users to train them in critical thinking skills and search techniques. They were also helping the remote users or web enchanted users using these digital devices.

6. LEADERSHIP ROLE AND MANAGERIAL SKILLS IN DIGITAL ERA

Another major role of a library professional is to provide leadership and expertise in designing, developing and ethically managing the knowledge-based information systems in order to meet the information requirement of the users. The librarians have to enrich their managerial skills. They must be proactive in organizing, managing and disseminating e-literacy to the users. They should be positive to provide information resources to patrons -regardless of the format. Today, the information professionals are required to fulfil the greater and demanding needs of users. Professionals should be able to satisfy all types of users especially research scholars and young generation who make use of internet more often than others. Up-gradating their knowledge and about the latest information technology is another challenge for the professionals. It is also expected that they should be able to create user friendly library website to share the information with their users. Some of the professionals and libraries are very active through their blogs, twitter account, Facebook and other social networking sites. It is a demand from the users that librarians should congregate electronic information; create electronic vanguards and front-end search tools for accessing and dissemination of information. Author believes that Information professional in this digital age are more in demand and valuable due to the vast knowledge, expertise, social literacy skill, community relations skills, and zeal for disseminating this knowledge to the patrons. The quantity of information available on the Internet is tremulous. Looking for accurate information, finding the best possibilities for research and access to digital resources without guidance of a professional friend like a Librarian is cumbersome. Library professional is someone who makes patrons job easy for sorting of things and organize the sources of information. In many cases, librarians are playing a role of a teacher by educating library patrons by orienting and training them in accessing and usage of digital library. Many libraries have become focal points or centres for technology training where the users are getting low-cost or free training through variety of mediums that are being provided by the information professionals. Librarians are now becoming key partners in community development partners and public relation professionals rather than mere a custodian of books, videos, and digital archivists. Many Libraries are organizing and hosting community events, networking with other libraries and database systems and encouraging interaction to increase the quality of materials for their patrons. Librarians today are providing access, guidance and training in both physical and electronic materials housed in the library and in online digital databases available.

The enormous increase in web-based services is shifting attention to the virtual, rather than the physical library. For professional development also these digital reference services, free access to large-scale data banks and secure retrieval has become essential areas and there is certainly more to come in this significant sphere of innovation.

The librarian’s traditional role as ‘cultural custodian’ or, in the 1980s as ‘cultural guide’, was not in favor of librarian’s function (Drotner, 2005). Today they are assisting as key players in disseminating effective information to the development of information literacy to the users.

The term knowledge society is today more of learning than educating. The creation of knowledge is not only means providing formal settings such as schools and work places and educating but also to train them by effective learning. The competences necessary for advancing the knowledge society have to stress upon creative ways of thinking, acting and cooperating so that existing knowledge is not only preserved and stored, but so that new forms of knowledge are developed and new types of action are designed for the knowledge seekers. The development of creative competences is closely related to people’s active participation of media and ICTs. Today it is possible to digitize all forms of signs (e.g. text, sound, live and still pictures). The last decade has witnessed a technological and economic transition of telecommunication, mass media and ICTs. It is becoming less and less feasible to isolate knowledge society from ICTs. They are now bonded with each other whether it is a classroom teaching through smart boards or online teaching through any open sources.
7. THE CHALLENGE
Every library in digital era needs data to justify their existence and securing resources. Data is required to respond to the pressure of the expenditure and to demonstrate the outcomes the Universities and Institute Management achieve while using it. Data is required to find appropriate balance of resources and to plan for the future of their organisations. Professionals are struggling as to how and what to measure theses inputs and outputs contents in the digital environment. Few years back a study was conducted by Drexel University regarding the costs associated with electronic journals to illustrate the complexity of doing cost analyses of electronic resources. It was revealed that the purchasing power of an electronic journal dollar is greater than that of print journal dollar because of bundled package and availability of back files which resulted in provision of the requisite infrastructure of hardware, software and increase in operating costs of systems staff significantly. The study also revealed that procuring these electronic journals created significant shifts in not only in staffing and but also in the operational costs. But it is a fact that in digital era these resources are very essential as the users of the electronic age demands publication at his desktop within a blink of his/her eyes.

8. USER EXPECTATION AND EXPERIENCES
The libraries are supposed to be more proactive to engage its users in today’s arena. Librarians should serve as conveners, bringing the user’s community together to articulate the aspiration and innovations to become an active partner as a driving force in community development and community change. They should organise training for trainers’ programmes for the users. Unlike the traditional libraries as passive provider of information, reacting to community needs; Modern libraries have opened its’ doors for users to use the materials and services 24x7. The dramatic growth in the usage of eBooks and other digital contents has attracted the attention of users. The reality is that the librarians are experiencing a number of transformations. Libraries are interaction with their users through social networking sites such as Facebook, Twitter, and Pinterest etc. Librarians are now actively involving users in creating of content and mass sourcing of educational resources and functions. Most of the academic libraries are now maintaining institutional repositories of digital content created by faculty and staff of the institute. Some libraries now offer business incubator services and spaces. The current generation is born in a digital era and hence cannot remember an era without the internet or handheld devices like mobiles. That is the reason that today the young generation expect services to be available 24x7.

9. LIBRARY 2.0 CONCEPT
Dr. A.P.J. Kalam stated that the digital library is something where the past meets the present and create the future. Library 2.0 is the concept that is providing new tools to make the library space more interactive, collaborative and community driven as per the community needs in both virtual and physical form. In any user-centric library, quality service and user satisfaction is the primary goal of any library. Technology is playing a tremendous role in this change and development. This change is also emphasizing new requirements on professional’s competencies and skills. The direction of flow of information and ideas from library to the users and from users to the library is a major component of any modern library. The user is participant, co-creator planner and planner now, whether the service is virtual or physical.

Hence the key concepts of Library 2.0 as per K.G. Schneider is:- The library is everywhere
1. The library has no barriers
2. The library invites participation
3. The library uses flexible, best-of-breed, component-based systems
4. The library is human centered organization.
5. The library is a place with unrestricted access to information

10. LIBRARIAN VS CYBRARIAN
Due to the advent in the information resources being provided through online librarians are changing their status as Cybrarian. These cybrarians requires two main types of competencies – first is the professional competency and the second is the personal competency. Professional competency is the skills and knowledge in the area of information resources. Accessing and retrieving the information using technology and managing research and using these skills is the basis for providing right services to the users. Personal competence represents a set of skill, attitude and values that enable a Librarian or cybrarian to work efficiently like communication skills, value added nature of their services and good managerial skills. Librarians of new era has transformed from a custodian of information to a facilitator or navigator.

11. CONCLUSION
Once upon time information professional were treated as the caretakers of books and advisors to the library users. But now the day-to-day and moment-to-moment responsibilities are dramatically changing. The new era of the digital age and the affect is also very challenging for the librarians and sometime more challenges are being
faced due to rapid change in the technology. Now, they have to keep up-to-date with latest developments coming across all technologies and mediums and also have to provide traditional onsite librarian functions. Due to this of library science, the degree programs in Library Science and Information are adopting technological changes and becoming more inclusive of technology and media training. Today it is a demand or need of the hour to empower LIS professionals working in the academic or any other libraries and their end users to make aware of the usage of the printed as well as e-resources and to explain the roles of Web 2.0 in making library users more interactive and well informed about the resources, products and services. The dynamic nature of information has forced users to change their way of seeking information. Hence, it is an immediate need for the information professionals to update the services and facilities of the library. The librarian of today should act as an ultimate search engine and satisfy the information needs of the users. The librarians today should be tech savvy and should continuously learn and update their knowledge about new technologies. Library Technology is reaching beyond the library walls to giving the information resources into the hands of end users via computer networks whenever and wherever required.

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APPLICATION OF KNOWLEDGE MANAGEMENT IN NEWSPAPER LIBRARIES IN INDIA

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ABSTRACT

In India serving the information with 792 channels, among them 392 are news channels, most 24 x 7, the Indian news television and 13,519 news papers genre are booming in the country in English and various Indian languages. The development is already taken place in media Domine. In the present globalized economy, to be competitive and successful, media enterprises along with other basic resources such as money, materials, manpower also needs high quality information resources. While the professionals working in a media organization may have more than one information channels to obtain such information source. It is primarily the responsibility of media library/ information center to cater the information needs of editors, journalists, photographers, freelances and other employees of the newspaper organization. Knowledge management in newspaper organization is concept aimed at enhancing and improving information to updating and gaining profits with the highest circulations. However, the tools and techniques of information management can also be applied in the newspaper organizations, such libraries to improve their services to meet the changing user needs. The news environment in which today’s libraries operate, drastically transformed due to the arrival of e-resources and the Internet. The librarian’s role in knowledge management and improvement in library services and user satisfaction of media mechanics.

Keywords: Media libraries, Communication Technology, Automation, Archiving, Text processing, User interfaces, Information management.

1. INTRODUCTION

The functions of a newspaper library as J.Lewis in his booklet on “Newspaper Libraries” defines it, is “to act as depository of all information required by the editorial and management departments of a newspaper”. The definition is rather inadequate. For, it is not enough to store all the material.

Since long back newspaper has been considered as an important source of information. The generation of current and varieties of information in large quantity makes it distinct from other information management in media. It is frequently used by people from all strata of the society for their current awareness, and is used considerably by the academicians, researchers and practitioners, politicians and administrators, economists, and many others in various fields of knowledge and activities seek information from newspapers for solving day-to-day problems and/or for their research work.

A large number of newspapers published throughout the world with mountain of information create severe problem for the information professionals regarding the storage and retrieval of such information. Considering the specialties and importance of newspaper as information management in media, the issue is of special concern for the information professionals. Several newspaper information retrieval systems and projects in different places of India.

As the revolution in transportation and communication made our physical world smaller and smaller, the body of knowledge which the average citizen needed to make the simplest political or civil decision grow at a corresponding rate. The fall-out from the newspapers, a newspaper library receives tremendous amount of other material. This includes hand-outs, issued by Government, industrial, trade and other organizations, leaflets, booklets, periodicals, acts and bills, memoranda, reports of seminars, symposia, workshops, etc.

Current Trends in Indian Media Library Services

The India media industry is growing rapidly at global level with revenues of about 850 billion INR, is set to grow robustly over the next few years. Revenues are expected to reach 1764 billion INR by 2016. In the present globalization economy, to be competitive and successful, a media enterprises along with other basic resources. In the present globalization economy, to be competitive and successful, the Indian media enterprises along with other basic resources such as money, materials, manpower also needs high quality information resources. While the library professionals working in a media organization may have more channels to obtain such information sources, it is primarily the responsibility of a media library cater to the information needs of its contributors. There fulfilling the information needs of media industry professionals like journalists, writers, photographers and content researchers is a challenge as well as an opportunity for the library professionals.
Media of India

Language wise certified circulation figures for the audit period July Dec 2014

<table>
<thead>
<tr>
<th>Language</th>
<th>Circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>2,49,02,513</td>
</tr>
<tr>
<td>English</td>
<td>1,23,20,232</td>
</tr>
<tr>
<td>Malayalam</td>
<td>44,15,875</td>
</tr>
<tr>
<td>Marathi</td>
<td>56,79,273</td>
</tr>
<tr>
<td>Tamil</td>
<td>43,11,421</td>
</tr>
<tr>
<td>Bengali</td>
<td>39,52,071</td>
</tr>
<tr>
<td>Telugu</td>
<td>38,80,568</td>
</tr>
<tr>
<td>Kannada</td>
<td>28,45,405</td>
</tr>
<tr>
<td>Gujarati</td>
<td>10,42,075</td>
</tr>
<tr>
<td>Others</td>
<td>25,60,824</td>
</tr>
</tbody>
</table>

Media of India consist of several different types of communications media: television, radio cinema, newspapers, magazines, Internet-based Web sites. Many of the media are controlled by large for-profit corporations who reap revenue from advertising, subscriptions, and sale of copyrighted material. India also has a strong music and film industry. India has more than 398 (highest Circulated) newspapers and over 562 satellite channels and is the biggest newspaper market in the world over 100 million copies sold each day.

The Indian media was initiated since the last 18th century with print media started in 1780, radio broadcasting initiated in 1927, and the screening of Auguste and Louis Lumiere moving pictures in Bombay initiated during the July 1895 is among the oldest largest media of the world. Indian media –private media in particular has been “Free and Independent” throughout most of its history. The period of emergency (1975-1977), declared by Prime Minister Indira Gandhi, was the brief period when India’s media was faced with potential government retribution.

The organisation Reporters without Borders compiles and publishers an annual ranking of countries based upon the organisation’s assessment of their press freedom.

<table>
<thead>
<tr>
<th>Population of Republic of India</th>
<th>1,285,670,056</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Daily News papers</td>
<td>398</td>
</tr>
<tr>
<td>Total Circulation</td>
<td>30,772,000</td>
</tr>
<tr>
<td>Circulation</td>
<td>13 per 1,000</td>
</tr>
<tr>
<td>Number of Non Daily News papers</td>
<td>98</td>
</tr>
<tr>
<td>Number of Television Stations</td>
<td>562</td>
</tr>
<tr>
<td>Number of Television sets</td>
<td>63,000,000</td>
</tr>
<tr>
<td>Television sets for 1,000</td>
<td>61.2</td>
</tr>
<tr>
<td>Number of cable subscribers</td>
<td>39,112,150</td>
</tr>
<tr>
<td>Cable subscribers per 1,000</td>
<td>38.5</td>
</tr>
<tr>
<td>Number of Radio Stations</td>
<td>312</td>
</tr>
<tr>
<td>Number of Radio Receivers</td>
<td>116,000,000</td>
</tr>
<tr>
<td>Radio Receivers per1,000</td>
<td>112.6</td>
</tr>
<tr>
<td>Number of Individuals with Computers</td>
<td>4,600,000</td>
</tr>
<tr>
<td>Computers per 1000</td>
<td>4.5</td>
</tr>
<tr>
<td>Number of Individual with Internet Access</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Internet Access per 1,000</td>
<td>4.9</td>
</tr>
</tbody>
</table>
The mother of all freedoms

A free press is a distinctive feature of democratic society. It acts as shield against misrule. The press, which earlier meant only the print medium, and now includes radio, television and Internet is almost the only source on which the citizens depends for news about what is happening around him.

Stalwarts of the likes Sir Winston Churchill, Nehru and Gandhi have emphasized the role of a free press in a democratic setup. Churchill called a free press “the unsleeping guardian of every right that free men prize.” Nehru observed, “To my mind the freedom of the press is not just a slogan from the larger point of view but it is an essential attribute of democratic process. Mahatma Gandhi said “sole aim of journalism should be service. The press is a great power, but just as an unchained torrent of water submerges whole, and a sincere sense of social responsibility will help journalism and the society as well.”

The struggle in India

From the beginning of the rule of the East India Company in India, the rules were not only aware of this fact but were also ready to take action agonist newspapers which did not tow the official line. The day was still far off when newspapers would demand a greater say for off when newspapers would demand a greater say for the people of India in the administration of their country. Questioning the ethics of foreign rule in India or the demand for self-rule was in India or the demand for self-rule was far off.

The Conformation between the Government and the press began from the day. The Bengal Gazette or Calcutta General Advertiser appeared for the first time in Calcutta on 29th March 1780. Its publisher-editor, James Augustus Hicky was a firm believer in the freedom of the press and refused to follow the dictates of the rules.

Freedom Struggle and the Indian Press

The differences between the newspapers controlled by British interests on the one hand and hand and newspapers run by Indians on the other, sharpened in the 20th century. The Government made no secret of its sullen and often open hospitality to Indian newspapers, which supported the younger group of leaders in Congress and advocated active methods to secure readressal from the Government.

The Gandhian era in Indian politics began in 1920. He used a novel weapon-satyagraha to organize non-violent protest against the high handiness of the Government. The changes in the world scenario after World War and the emergence of Mahatma Gandhi as the undisputed leader of the Congress affected the role as well as growth of the Indian press. Newspaper publication becomes an important from in the war of independence.

Almost all great Indian leaders of the freedom struggle Mahatma Gandhi, Lokmanya Tilak, Pandit Malaviya, Lala Lajpat Rai, Maulana Azad, C.R.Das, C.Rajagopalachari, Jawaharlal Nehru among others were basically political leaders. They had their own newspapers because they felt that it was the best mean of carrying their message to the people. Then there the large number of journalists working in English and Indian language newspapers who might not take active part in politics but had a strong commitment to the national cause. The house of Birlas published the Hindustan Times and the Hindu daily Hindustan

2. KNOWLEDGE MANAGEMENT AND NEW GENERATION OF LIBRARIES INFORMATION SERVICES: A CONCEPT IN NEWSPAPER ORGANIZATION

The media Library will plays a very crucial role in the extension and modification of knowledge. The growing need for knowledge management has influenced very component and operation of a library. Knowledge management requires more effective methods of information handling, speedy transfer of information and linking of information with individuals and their activities. It demands library patron centered development of information systems and services and customization of media information at the individual level. Media Libraries have been thought of as being expert at collecting and organizing news related information and it also highlights the importance of library7 and information professionals in news paper organizations such as knowledge creation, acquisition, preservation and sharing knowledge and information among the journalists.

Knowledge management has rapidly moved beyond the stage of a trend and has established itself as a key part of news preparing. The concept of knowledge-based right amount of information at the right time has long since been an important factor for all newspaper libraries.

The concept of the knowledge Management was started and popularized in the electronic media and newspaper business world during this modern age. The importance of knowledge in the global economy of the knowledge age. The application of knowledge management have spread to other organizations including government agencies, research and development departments, universities and other knowledge embedded in the organization’s.
3. **PRINCIPLES OF KNOWLEDGE MANAGEMENT IN NEWSPAPER LIBRARIES**

1. Knowledge management means improving work process knowledge
2. Knowledge management access is only the beginning
3. Knowledge management is expansive
4. Knowledge management never ends
5. Knowledge management requires a knowledge contact.

4. **NEED FOR KNOWLEDGE MANAGEMENT**

Knowledge management is an important asset for newspaper organization because knowledge management provides access to various aspects like interviews with prominent personalities like politicians and cine actors provide access to various aspects and expertise that creates new capabilities which enable better performance, encourage innovation user value. Today every newspaper organization needs to know their knowledge aspects assets, how to manage and make use of these assets to serve the up dated news to the newspaper customers.

5. **BENEFITS OF KNOWLEDGE MANAGEMENT**

Knowledge management applications could benefit in news production process, users’ and services, strategic planning in the following way.

- Improve d services for editorial staff
- Facilitation of interdisciplinary news research
- Improved services capability photo journalists, and other freelancers.
- Improved responsiveness and communication capabilities.

6. **KNOWLEDGE MANAGEMENT IN NEWSPAPER LIBRARIES (Morgue)**

Knowledge Management is considered as an organizational asset and the expertise knowledge, interaction and communication of individuals, forming a collective knowledge base for communities of practice and there is a necessity for strong, creating, sharing and re-using knowledge for news presentation.

Information is a central need for organizations. Information Management is “an impressive term for the various activities that contribute to the effective production, co-ordination, storage, retrieval and dissemination of information in whatever format. Internal or external sources, leading to the more efficient working of the organization. To remain competitive it is necessary for organizations to efficiently and effectively create, locate, capture and share their organization’s knowledge and expertise which necessities making explicit and strong for distribution for local editions.

The Newspaper librarian’s job involves apart from providing traditional and Digital service for updated news publication. Newspaper libraries are repositories of information with documentary sources, Photos, videos’, Press clippings are the key information of the newspaper organization. Librarians who is a experienced in information field are constantly working closely with Editor, freelancers, journalists and photographers are he users who are the members of the organization, and it is easy for the promotion of interaction between the users. Librarians have an interaction with other district edition producers. They are an important base for the newspaper organization.

7. **CHANGING ROLE OF NEWSPAPER LIBRARY PROFESSIONAL IN DIGITAL AGE**

In the present technological /Internet era the library professionals have to change themselves as the information profession is being changed. The electronic information age provides new opportunities for organizations to produce as well as use information products up-to-date. Newspaper librarians, given their familiarity with the information marketplace, can be contributors to the development, marketing and use of information products. Now information specialists have to work as e-information resources in which various professional groups are expected to map strategies that lead to produce, manage, maintain and service the information. An information professional has to work as:

*Librarian*

*Information Manager Information adviser/instructor System and Networking professional*

*Provide services to the end user*

*Sharing of information and understanding the user time line*
The unique contributions of the newspaper librarian include expertise in content and selection of the updated information available in print and electronic information resources as well as a commitment to putting knowledge to work. In other words, linking the information user with prompt information resources at the right time. The newspaper librarian may be a full-time member of an information management team in a newspaper organization.

8. CONCLUSION

It can be clearly seen that the newspaper environment in which the librarians operate today is changing. It is both faced with challenges from other newspaper organizations thrown open by information and communication technologies. One way of doing that is engaging in knowledge management activities that are creating, capturing, sharing and utilizing knowledge achieve the organizations goals. Digital age has brought a tremendous change in the way of information is stored and accessed. This has brought about a change in the concept of newspaper librarian, their collection and services. Many new terms viz. Digital librarian, libraries without walls, virtual libraries, is emerging to describe the libraries of digital age. There are a few basic changes that poses challenges to modern media libraries towards acquiring and managing larger and larger information; they are globalization, decentralization, customization and acceleration. These factors make decision making extremely difficult. These problems can be overcome with effective utilization of traditional resources like manpower, materials and money as well as information and knowledge resources. Technology professionals and others to develop the appropriate knowledge management systems. Media libraries, with limited budget and human resources, should utilize the current management structure and technology to implement knowledge management, either bottom-up or top-down. With an effort, knowledge management will help to increase media libraries operational efficiency and later to the ever increasing needs of our clientele.

REFERENCES

CONTINUING EDUCATION IN LIBRARY SCIENCE: MANAGEMENT DEVELOPMENT PROGRAMMES IN INDIA

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ABSTRACT

Presently various organizations, associations, information centres and academic institutions are doing remarkable work in the field of continuing education in library and information science in India. Many Management Development Programmes (MDPs), Faculty Development Programme (FDPs) and Librarians Development Programme (LDPs) course are organizing in India for Library and Information managers. Asian Chapter, Special Libraries Association has also organized many seminars, conferences and education programs in India. Continuing Education Management development can play an essential role in enhancing inter-professional collaboration and in building capacity for the Library Science Professionals.

Keywords: Continuing Education, Continuing Professional Development, Management Development Programmes, Library Science

1. INTRODUCTION

Continuing Education (CE) and Continuing Professional Development (CPD) are interchangeably used to refer to lifelong learning aimed at improving, maintaining and intensifying of the knowledge, skills and attributes required for efficient professional practicing.[1] The main objective and goals of continuing education are lifelong learning; information exchange; maintaining intellectual interest in one's job and developing collegiality. With the information explosion, regular technological advancement and desirability of professionals to stay abreast it is essential that the Continuing education programmes should be a regular activity.[2] In addition to this Continuing Professional Development(CPD) involves not only educational activities to enhance the professional academic competence in the subject knowledge and skills, but also in management, team building, professionalism, interpersonal communication, technology, teaching, and accountability.[3]

2. NEEDS OF CONTINUING EDUCATION IN LIBRARY SCIENCE IN INDIA

Presently various organizations, associations, information centres and academic institutions are doing remarkable work in the field of continuing education in library and information science in India. These institutions include National Institute of Science Communication and Information Resources (NISCAIR), National Social Science Documentation Centre (NASSDOC), All India Institute of Medical Sciences (AIIMS), Indian Institute of Technology (IITs), Indian Institute of Management (IIMs), Asian Chapter, Special Libraries Association, Management Libraries Association, Indian Library Association (ILA), Indian Association of Special Libraries and Information Centres (IASLIC), Society for Library Professionals, Management Libraries Network (MANLIBNET), Developing Libraries Network (DELNET), Jawaharlal Nehru University, University of Delhi, INFLIBNET and many more. These institutions are regularly conducting several short time courses in the field of library computerization, library digitization, leadership, writing skill, proposal preparing skill, communication skill, professionals development, classification, cataloguing, indexing, multimedia, information and knowledge-management, collection management, content management, preservation and conservation. Many management institutions and associations like MANLIBNET started course in Management Development Programme (MDP) for Library and Information Managers. Universities are also providing three to four week refresher course for working professionals.

3. CONTINUING EDUCATION IN UNIVERSITIES IN INDIA

Many LIS courses are offered at different levels in Indian universities including Certificate, Diploma, BLIS, MLIS, MPhil, PGDLAN and PhD degrees. The distance education system has been fully grown in the country and is looked upon as a viable model for keeping pace with the rising demand for LIS courses. Most of the courses offered by Indian universities are now moving from conventional courses like teaching classification, cataloguing, reference, bibliography, library management and libraries and society to new courses on Information Technology, Digital Libraries, Information Architecture for Internet Services, Technologies in Web Content Management, Data Mining, Human Interaction with Computers, Scientific Data Management and many more. Almost all the course on LIS are now including the topics like multimedia packages, knowledge management,
decision support systems, digital library systems, use of electronic format of classification schemes, packaging and repackaging information in different formats, and online reference and information services. So the professionals in the jobs need to have continuing education to get abreast with new technologies and terminology. In keeping this view University Grants Commission (UGC) has strongly recommended short-term refresher courses for LIS teachers, orientation programmes in library automation and ICT application for all the professionals in Library Science for Carrier Advancement.

4. ROLE OF VARIOUS LIBRARY ASSOCIATIONS IN CONTINUING EDUCATION IN LIS

The Indian Library Association (ILA), one of the leading library associations of India, is conducting continuing education programme and at present offering some such courses. In the special library field, the Indian Association of Special Libraries Information Centres (IASLIC) is also offering different types of short-range courses, workshops, and annual conferences in different areas of library & information science. Workshops were arranged on professional development for LIS professionals during last five years.

Library networks and associations organized a number of annual events such as conferences, workshops, seminars, etc for library professionals. While these events are a platform and bridge for professional exchanges and learning, it is seen that in recent years pre-conference tutorials on ICT tools are also held regularly. Such pre-conference tutorials are usually not mandatory for all the registrants of the conference and are open to those who are interested to learn about ICT at an additional fee.[4]

a. Role of Asian Chapter, SLA in Continuing Education in LIS in Asia

Asian Chapter, Special Libraries Association has organized many lectures, seminars, conferences and education programs in Asia. In India, Asian Chapter has organized events in New Delhi, Jaipur, Ahmedabad, Jhansi, Lucknow, Kanpur etc. Many SLA leaders including SLA Presidents came as resource persons in these events from USA. Asian Chapter has started its important conference first International Conference of Asian Special Libraries (ICoASL 2008) from New Delhi, India and conducted second ICoASL 2011 in Tokyo, Japan then third ICoASL 2013 in Manila, Philippines and fourth ICoASL 2015 in Seoul, Korea. Asian Chapter, SLA also organizes a series of Conference in India namely “Library and Information Professionals Summit” in collaboration with Society for Library Professionals (LIPS). The first LIPS was held in 2012 when SLA President and many other officials were resource person for this. Second LIPS was held in 2013, third in 2014 and fourth was held in January 2015. Asian Chapter has organized A Training-Workshop on the Basics of Preservation, Conservation, Restoration & Data Curation in Vietnam, Lao and Philippines. The 3-country project of the SLA Asian Chapter was in partnership with the Goethe Institut (GI) in collaboration with the National Library of Vietnam (NLV), National Library of Lao (NLL), and the Association of Special Libraries of the Philippines (ASLP). The collaboration for the training-workshop was part of the capacity building initiative of the SLA Asian Chapter to preserve library materials for the South-East Asia libraries. The objective of the said project is to bridge the gap of learning by linking respective institutions through collaboration and sharing of valuable ideas and expertise. [5]

b. Management Libraries Network (MANLIBLET) and Management Institutes

Management Development Programme (MDPs), Faculty Development Programme (FDPs) and Librarians Development Programme (LDPs) course are organizing by Management Libraries Network and /with Management Institutes in India for Library and Information managers. The FDPs or MDPs, designed for teachers, researchers and corporate managers help them to enhance their skills and update their capabilities to keep pace with the changing management practices. The course work of LDP is designed in a manner that provides a unique opportunity to the participants in developing their expertise in managing various library systems and services. Ultimately, such programmes would help the LIS professionals to perform their duties effectively in their respective places of work [7].

c. Indian Association of Special Libraries and Information Centres (IASLIC)

IASLIC Organizing short-term training courses / workshops /round table meetings on various topics is a regular feature of the Education Division as part of the Association’s continuing education programme (CEP) to improve professional competencies. These courses are usually held in collaboration with University departments, specialized institutions, National Library of India and other professional bodies etc. at different parts of India. The Education Division brings out publications as a follow-up programme at times. The IASLIC holds a biennial seminar and a conference in alternate years. Current problems of libraries and information services and other allied areas are selected as themes for discussion on these occasions [8].

5. ROLE OF ACADEMIC INSTITUTIONS AND OTHER BODIES IN CONTINUING EDUCATION IN LIS

a. National Institute of Science Communication and Information Resources (NISCAIR)
The NISCAIR has strong Human Resource Development Programme for training personnel in library & information science, documentation, science communication and herbarium techniques. NISCAIR also undertakes projects on turnkey basis for other organizations. The projects cover design and development of databases, automation and modernization of libraries, editing and production of various publications like journals, books, conference proceedings, annual reports, etc.

CSIR-National Institute of Science Communication And Information Resources (CSIR-NISCAIR) has been providing human resource development programmes for the fast several decades. Equipped with necessary facilities and manpower, NISCAIR is ideally placed to train and prepare science communicators, R&D personnel, library and information science professionals for meeting the challenges of current times. NISCAIR's HRD Programmes can be categorized as follows:

i) Information Technology for Information Management
ii) Bibliometric tools and techniques for measurement and evaluation of research output
iii) Design and Development of Digital Libraries using GSDL – Basic
iv) Research Methodology
v) Library Automation using Koha - Basic
vi) Design and Development of Digital Libraries using Dspace – Basic
vii) Office Automation
viii) Library Automation and Networking
ix) Science communication through Print Media
x) Information Technology for Information Management
xi) Visual Documentation
xii) ABCD - A complete solution for libraries
xiii) Library Automation using Koha - Advance
xiv) Design and Development of Digital Libraries using Dspace - Advance
xv) Library Automation and Networking

Many informational professionals from all over Asia including Sri Lanka, Nepal, Bangladesh attended the above NISCAIR programmes.

b. Documentation Research and Training Centre (DRTC)

DRTC runs a graduate program leading to the award of a 'Master of Science in Library and Information Science' (MS-LIS) from the Indian Statistical Institute as well as serving as an academic and research center for Research Fellows registered for a PhD in Information Science. DRTC is perhaps, India's only "proper" school with a very strong research program. Research at DRTC generally focuses on the application of information technology to library and information science.

c. Developing Libraries Network (DELNET)

DELNET is organizing many training programmes all over the India for improvement of IT knowledge of library professionals in India. DELNET organizes many lectures and workshops and professional development programmes in different part of India. DELNET arranges tutorials, workshops, lectures, and training programmes every year from time to time besides the National Convention on Knowledge, Library and Information Networking (NACLIN).

d. The Energy and Resource Institute (TERI)

TERI has organized many programmes to develop leadership ability of the Librarians and library professionals. TERI is also organizing many workshop/programmes on knowledge management. TERI also organized five times International Conference on Digital Libraries, which is the best and knowledgeable conference in the world.

e. Information and Library Network (INFLIBNET)

INFLIBNET is involved in modernizing university libraries in India and connecting them as well as information centres in the country through a nation-wide high speed data network using the state-of-art technologies for the optimum utilization of information. INFLIBNET is set out to be a major player in promoting scholarly communication among academicians and researchers in India.

SOUL the In-house library automation software developed by INFLIBNET Centre is widely used at various universities and colleges. In order to have proper operation of the software. Many training programmes conducted by the centre. Many workshops are also organizing by INFLIBNET on Development of Institutional Repository using DSpace.
f. The National Social Science Documentation Centre (NASSDOC)

In order to familiarize librarians, information experts and social scientists, with the techniques of information technology, NASSDOC organizes training workshops, seminars and lectures under its Continuing Education Programme in different parts of the country. The objective of the NASSDOC is to provide library and information support services to social science researchers.[9]

6. CONTINUING EDUCATION AND MANAGEMENT DEVELOPMENT PROGRAMME

Unlike traditional continuing education that takes place in conference centers, university seminar rooms, and hotels, staff and faculty development for continuing education it should be more oriented to teams work and practice and at times when teams would otherwise be meeting. Continuing Education Management development can play an essential role in enhancing inter-professional collaboration and in building capacity for the Library Science Professionals. The CE programmes should emphasis on

- Team-based rounds
- Team-building exercises
- Case-based workshops
- Peer coaching and mentoring
- Web-based learning
- Preceptorship training
- Longitudinal programs
- Communities of practice
- Learning & Teaching tools and resources [10]

7. CONCLUSION

CPD demands professional skills that extend beyond library science knowledge such as management, education and training, information technology, audit, communication, and team building. This professional development education serves to strengthen competencies and skills and mandates that practitioners keep abreast of evolving trends and practices within the profession. Regardless of their practice setting, the participants are often tasked with the planning and presentation of CE programming. So this further help the professionals engaging in educational activities beyond those considered necessary for entrance into the field and reinforce previously acquired knowledge and skills for present-day applications. It is also engaging the working professionals in lifelong learning and prevents obsolescence of skills. [11]

REFERENCES

QUALITY ASSESSMENT OF LIBRARY WEBSITES OF IITs IN INDIA BASED ON KANO’S MODEL

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ABSTRACT

The quality of library websites of IITs in India have been assessed by using three main categories viz. ‘E-Resources’, ‘Services’, and ‘Web-centric’ aspects. The study extends Kano’s model to LIS application area at micro level by visualizing three quality levels within a particular information category covering various features. ‘E-resources’ include sub categories like e-books, e-journals, e-thesis, and online databases etc., ‘Services’ contain SDI, OPAC, Document delivery/ Interlibrary loan etc., and ‘Web-centric’ aspects include aesthetic appearance of home page, content presentation, ease of use, search process in websites and other navigational aspects etc. The objectives of the study are to systematically examine the library websites features of IITs based on Kano’s Model, and to assess the quality level of Library websites of IITs based on scores obtained by specific features presence as checkpoints. The findings reveal that Mumbai tops the list with 1st rank (40 scores) followed by Delhi (32), Gandhinagar (32) with 2nd rank each, and Bhubaneswar (28) and Kanpur (28) with 3rd rank. The trailing IITs pertain to Guwahati, Ropar, Mandi, and Roorkee. The lowest rank i.e. 10th is shared by Indore. Category wise analysis of overall score of all IITs indicate that although the ‘e-Resources’ are rich and ‘Web-centric aspect’ features are well planned and established, yet there seems to be a lack of provision of effective ‘Services’ while accessing the desired services/features. It is concluded that the findings of this study would be useful to the web designers and Library & Information science professionals who need to be aware about the implications of the quality features characteristics.

Keywords: Website features, Quality assessment, IIT, E-resources, E-services, Web-centric aspects, Library websites

1. INTRODUCTION

There is a lot of published literature on evaluation of library websites with the purpose of improving their quality. These include qualitative, quantitative, theoretical, and empirical studies (Dix, Abowd, & Finlay, 1993; Haak et al., 2004). Some papers (Allen, 2002; Nielsen, 2003) include usability, and usefulness as evaluation criteria. A variety of indicators and check points have been suggested by various authors but there is no universal agreement so far in this regard. At this juncture, however, a reference is hereby made of Kano’s model (1984) of quality which “identifies and distinguishes features according to three levels of quality dimensions viz. (i) ‘Basic’ or ‘Expected’ features taken for granted which should support expected needs of users (ii) ‘Normal’ features supporting different platforms and links to related material, and (iii) ‘Excited’ features which makes users delighted about the website, things which they do not expect but excite if they are there and generate loyalty. It emphasises that design of a website is of great importance in absence of face-to-face human interaction where service adjustments in terms of verbal and non-verbal (body language) is not possible”.

With the above background, it is intended to assess the quality of library websites of IITs (deemed universities) in India as academic institutions. For this purpose three main categories viz. ‘E-Resources’, ‘Services’, and ‘Web-centric’ aspects of respective institutions websites have been taken in to account. While the categories ‘E-resources’ and ‘Services’ relate to information architecture domain, Web-centric category is concerned more with the design aspects of the website. Further these have been evaluated at three levels based on Kano’s model each with respect to presence or absence of sub-categories under each main category.

For example for ‘E-resources’ sub categories like e-books, e-journals, e-thesis, and online databases etc. are covered, ‘Services’ include SDI, OPAC, Document delivery/ Interlibrary loan etc., and ‘Web-centric’ features would cover aesthetic appearance of home page, content presentation, ease of use, search process in websites and other navigational aspects etc. Users are dissatisfied if the ‘Expected or Basic’ features are not there in website. Further web designers will be aware that these features do not serve any purpose by merely being in place, but ‘Normal’ features can only facilitate users task performance and satisfy their perceived needs to make website more relevant and useful. Finally, to satisfy users latent needs, building their loyalty, motivating users and ensuring them to stay connected more features are required under ‘Exciting’ level of quality. This would be an additional advantage in chalkng out a website management strategy in this competitive web environment.
2. KANO’S MODEL AND QUALITY OF WEBSITES

Noriaki Kano developed a model to illustrate how customers perceive quality. The model is based around the level of achievement compared to the level of customer satisfaction. Product features are divided into three distinct categories as mentioned in Sec 1. It describes the relationship between customer satisfaction and performance of a product or service and varies with the three categories. ‘Basic’ quality should not be presumed as below standard, rather it implies that the user does not care much about the product or service. The word ‘Normal’ is more concerned with performance quality i.e. anything which can be objectively tested and measured compared with competition. Lastly the ‘Excitement’ quality means some advanced and new features to maximise customer satisfaction. With the growing importance of e-resources, and services, the need to identify the web design features for its full potential by the users is very important. Kano’s model gives us a theoretical framework to know the distinguished features of websites as quality dimension subsets. The present study extends Kano’s model not only to LIS application area but also to micro level by visualizing three quality levels within a particular information category covering various features. For this purpose three main categories viz. E-resources, Services, and Web-centric aspects have been taken in to consideration. This selection criteria is somewhat based on findings of Calvert and Hernon (1997, p. 412; cited in Praditpeera, 2001) who report that “library quality revolves around information resources, environment in which services are provided, staff delivering services, equipment by which process of service delivery is facilitated and paying attention to changing needs of users, i.e. constant users’ need assessment to adapt services as a whole to their demands”.

3. OBJECTIVES

(i) To systematically examine the library websites features of IITs based on Kano’s Model

(ii) To assess the quality level of Library websites of IITs based on scores obtained by specific features presence as checkpoints

4. METHODOLOGY AND DATA COLLECTION

All the websites of IIT libraries were visited during 14-30 Aug, 2015 to know the frequent and common information categories along with the features of the same. Based on three main categories viz. E-resources, Services, and Web-centric aspects, various sub categories were identified. These are: e-books, e-journals, e-thesis, institutional repositories, Multimedia, online databases under E-resources; Document Delivery/Inter library loan, E-reference service/Help/Info desk, SDI Service (e.g. My Library), OPAC/Web-OPAC, Search facility, and Social network under Services. Lastly the Web-centric features cover Aesthetic appearance, Content representation, Easy to use, Efficiency, Navigation, and Search Process. Further, at micro level various features under each level i.e. ‘Basic’, ‘Normal’, and ‘Excited’ were also identified by actually checking the respective websites. These features have been specified in Tables 1, 2 and 3 for three main categories respectively. Some of the features were only available on intranet, so the same could not be verified and thus have not been taken in counting scores. For presence of a particular feature the mark ‘Y’ is given whereas ‘N’ denotes its absence. Data thus collected have been tabulated in Tables 4, 5, and 6 and these three main tables have been sub-divided in to two tables each taking 7 and 8 IITs respectively under each main table i.e. Tables 4(a), 4(b), Tables 5(a), 5(b), and Tables 6(a), 6(b). L1, L2, and L3 represent three levels of checkpoints score after counting number of ‘Y’s under each main category pertaining to particular IIT. It may be noted that the features specified here have been identified after carefully browsing the websites from a librarian point of view and are illustrative in nature. So, there may be more features also to qualify under the scope of various sub-categories of E-resources, Services, and Web-centric aspects. An attempt has been made to cover some of the very common and frequently used but typical features under each level.

Table 1 Description of Quality level checkpoints for E-Resources category

<table>
<thead>
<tr>
<th>Sub-categories</th>
<th>Basic features (L1)</th>
<th>Normal features (L2)</th>
<th>Excited/Advanced features (L3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-books</td>
<td>Providing information through clear mechanism</td>
<td>Availability of Preview TOC/alphabetical listing</td>
<td>Sharing and managing new arrivals with customised subject needs Additional related links(referral links)</td>
</tr>
<tr>
<td>e-journals</td>
<td>Providing information through clear</td>
<td>Availability of e-journals with diff types and status All breakup like open</td>
<td>Complete coverage (in terms of chronology) Novelty and</td>
</tr>
<tr>
<td></td>
<td>Mechanism including current journals</td>
<td>source or subscribed or other status</td>
<td>information</td>
</tr>
<tr>
<td>Sub-categories</td>
<td>Basic features (L1)</td>
<td>Normal features (L2)</td>
<td>Excited features (L3)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>e-thesis</td>
<td>Accessibility and availability of list browsing</td>
<td>Provision of searching by various elements like researcher, guide, title, subject, year etc. Clear indication of facilities and rights for various types of users</td>
<td>Seamless downloading for users</td>
</tr>
<tr>
<td>Institutional repositories</td>
<td>Accessibility and availability of list for browsing</td>
<td>Offering all document management functionalities Containing a wide range of digital objects like image, sound, video files, and text</td>
<td>Mechanisms for federating with other local and global repositories, OAIPMH</td>
</tr>
<tr>
<td>Multimedia</td>
<td>Accessing List of audio/video CDs in helpful sequence</td>
<td>Availability of equipped stations for using (viewing and listening) audiovisual materials</td>
<td>Facility for downloading &amp; sharing video clips of lectures delivered by renowned authors/teachers for students/</td>
</tr>
<tr>
<td>Online databases</td>
<td>Accessibility and availability of list for browsing</td>
<td>Number and types of existing subscribed databases including open sources</td>
<td>Offering online guides and tutorials</td>
</tr>
</tbody>
</table>

Table 2 Description of Quality level checkpoints for Services category

<table>
<thead>
<tr>
<th>Sub-categories</th>
<th>Basic features (L1)</th>
<th>Normal features (L2)</th>
<th>Excited features (L3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document Delivery/Inter library loan</td>
<td>Clear status of availability of books/documents in the resources (collection) of visited library website</td>
<td>Active links of referred sources with status, access and availability terms &amp; conditions</td>
<td>Ease of borrowing books and documents e.g. interactive and online feedback system</td>
</tr>
<tr>
<td>E-reference service/Help/Info desk</td>
<td>Contact details and FAQ</td>
<td>Existence of general services such as e-mail</td>
<td>Provision of other useful links like Mobile app</td>
</tr>
<tr>
<td>SDI Service (e.g. My Library)</td>
<td>Providing information through clear</td>
<td>Providing Circulation (availability of books) and reservation status</td>
<td>RSS Feeds, Alerts, Remote access</td>
</tr>
<tr>
<td>OPAC/Web-OPAC</td>
<td>All types of documents to be included</td>
<td>Seamless access and clear indication of status of availability w.r.t open source or subscribed with rights for full text access etc.</td>
<td>24X7 facility</td>
</tr>
<tr>
<td>Search Facility</td>
<td>Simple (keyword and free term) search and browsing</td>
<td>Advanced search (Boolean, proximity etc)</td>
<td>Saved records management including sharing, e-mail, location, and status of availability of record in library</td>
</tr>
<tr>
<td>Social network</td>
<td>Facility of library’s blog</td>
<td>Chat facility with librarian/Library staff in working hours</td>
<td>Instant messaging Services Promoting Library 2.0 as user-centered virtual community with multimedia presence</td>
</tr>
</tbody>
</table>

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Table 3 Description of Quality level checkpoints for Web-centric category

<table>
<thead>
<tr>
<th>Sub-categories</th>
<th>Basic features (L1)</th>
<th>Normal features (L2)</th>
<th>Excited features (L3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic appearance</td>
<td>Home page scrolling does not distract visual appeal and is helpful</td>
<td>Appearance is visually appealing and not cluttered</td>
<td>Attractive photo gallery for library sections/ features</td>
</tr>
<tr>
<td>Content Presentation</td>
<td>Consistent page headings and associated links for easy page recognition</td>
<td>Clearly identify changes in the natural language of a document’s text and any text equivalents (e.g., captions).</td>
<td>‘Contact information’ is accessible from every page</td>
</tr>
<tr>
<td>Easy to use</td>
<td>Provide information about the general layout of a site (e.g., a site map or table of contents).</td>
<td>User-friendly interface) Findability (ease of finding items in the web site) 'Undo' or 'back' function is easy and user-input is not lost with the 'back' button While interacting whether there is clear indication for visited and non-visited links by using colour</td>
<td>Helping users find and locate needed information Page loading/information retrieval in progress conveys accurate status messages.</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Pages load faster – speed is important</td>
<td>Downloading process does not lead to 'hang' situation and time out feature is clearly specified.</td>
<td>Increasing browsing efficiency by adopting new techniques e.g. icons or symbols for quick identification of items</td>
</tr>
<tr>
<td>Navigation</td>
<td>Multiple sections, categories or sub-categories are clearly and visually defined with category headings separated visually from</td>
<td>Correct navigation titles are used for describing linked page with a clear knowledge of what the user is going to get</td>
<td>All heading elements are clickable links while using multiple sections/ categories in navigation including drop-down menu</td>
</tr>
<tr>
<td>Search Process</td>
<td>Availability of basic search function in OPAC/Web-OPAC</td>
<td>Enable different types of searches for different skill levels and preferences including A-Z list and advanced search</td>
<td>A guided tour for various types and strategy of searches with examples before performing the required search. One stop search for catalogues, article indexes and databases on homepage Single window search</td>
</tr>
</tbody>
</table>

Table 4(a) E-Resources Quality Level Checkpoints Counts for IIT Libraries Websites-Part I

<table>
<thead>
<tr>
<th>ITs</th>
<th>Bhubaneswar</th>
<th>Chennai</th>
<th>Delhi</th>
<th>Gandhinagar</th>
<th>Guwahati</th>
<th>Hyderabad</th>
<th>Indore</th>
<th>Jodhpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
</tr>
<tr>
<td>E-Books</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>E-Journals</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>E-thesis</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Institutional Repository</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Multi-media</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Online databases</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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<tr>
<td>Total Score</td>
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<td>1</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

IB = Intranet Based
### Table 4(b) E-resources Quality Level Checkpoints Counts for IIT Library Websites –Part II

<table>
<thead>
<tr>
<th>ITs</th>
<th>Mandi</th>
<th>Mumbai</th>
<th>Patna</th>
<th>Roorkee</th>
<th>Ropar</th>
<th>Kanpur</th>
<th>Kharagpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
</tr>
<tr>
<td>E-Books</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>E-Journals</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
</tr>
<tr>
<td>E-thesis</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
<td>N</td>
<td>Y</td>
<td>IB</td>
<td>IB</td>
</tr>
<tr>
<td>Institutional repository</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>IB</td>
</tr>
<tr>
<td>Multimedia</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Online databases</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>IB</td>
<td>IB</td>
</tr>
<tr>
<td>Total Score</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>3</td>
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</tbody>
</table>

**IB= Intranet Based**

### Table 5(a) Services Quality Level Checkpoints Counts for IIT Library Websites – Part I

<table>
<thead>
<tr>
<th>ITs</th>
<th>Bhubaneswar</th>
<th>Chennai</th>
<th>Delhi</th>
<th>Gandhinagar</th>
<th>Guwahati</th>
<th>Hyderabad</th>
<th>Indore</th>
<th>Jodhpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
</tr>
<tr>
<td>Document Delivery/Inter library loan</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>E-reference service/Help/Info desk</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>SDI Service (Eg. My Library)</td>
<td>Y</td>
<td>Y</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>OPAC/Web-OPAC</td>
<td>Y</td>
<td>IB</td>
<td>IB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Search Facility</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Social network</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Total Score</td>
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<td>2</td>
<td>3</td>
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</tbody>
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**IB= Intranet Based**

### Table 5(b) Services Quality Level Checkpoints Counts for IIT Library Websites – Part II

<table>
<thead>
<tr>
<th>ITs</th>
<th>Mandi</th>
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<th>Patna</th>
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<th>Ropar</th>
<th>Kanpur</th>
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</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
</tr>
<tr>
<td>Document Delivery/Inter library loan</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>E-reference service/Help/Info desk</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>SDI Service (Eg. My Library)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
<td>IB</td>
</tr>
<tr>
<td>OPAC/Web-OPAC</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Search Facility</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Social network</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Total Score</td>
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<td>5</td>
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<td>1</td>
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</tr>
</tbody>
</table>

**IB= Intranet Based**
### Table 6(a) Web-Centric Quality Level Checkpoints Counts for IIT Library Websites – Part I

<table>
<thead>
<tr>
<th>ITs</th>
<th>Bhubaneswar</th>
<th>Chennai</th>
<th>Delhi</th>
<th>Gandhinagar</th>
<th>Guwahati</th>
<th>Hyderabad</th>
<th>Indore</th>
<th>Jodhpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
</tr>
<tr>
<td>Aesthetic appearance</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Content Presentation</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Easy to use</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Navigation</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Search Process</td>
<td>B</td>
<td>B</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
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<td>Total Score</td>
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</tbody>
</table>

**IB= Intranet Based**

### Table 6(b) Web-Centric Quality Level Checkpoints Counts for IIT Library Websites – Part I

<table>
<thead>
<tr>
<th>ITs</th>
<th>Mandi</th>
<th>Mumbai</th>
<th>Patna</th>
<th>Roorkee</th>
<th>Ropar</th>
<th>Kanpur</th>
<th>Kharagpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
<td>L2</td>
<td>L3</td>
<td>L1</td>
</tr>
<tr>
<td>Aesthetic appearance</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Content</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Easy to use</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Navigation</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Search Process</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Total Score</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**IB= Intranet Based**

5. LIMITATIONS

1. Selection of features in sub categories is representative and have been based on experience of using websites and may not be taken as standard exhaustive list.

2. Some of the links on the web pages lead to Intranet pages information for which no access could be made. In such cases for uniformity the resultant score is taken as nil (‘N’) and not ‘Y’ since actual working of respective linked information could not be observed.

3. The resultant score is based on presence or absence of a particular feature of the web page and is from the librarian’s point of view using inspection technique and do not represent users view point.

6. ANALYSIS

Table 7 provides a consolidated figure for counts related to E-resources, Services, and Web-centric aspects of all IITs and are derived from the tabulated data above. Year of foundation of each IIT is also provided in parenthesis along with each IIT city name. Based on the total figures, a rank is given to each IIT. It is observed that Mumbai tops the list with 1st rank (40 scores) followed by Gandhinagar (32) and Delhi (30) with 2nd and 3rd rank respectively. The trailing IITs pertain to Guwahati, Indore, and Ropar with 10th rank each. The last rank i.e., 11th is shared by Mandi and Roorkee. Interestingly, a pattern of proportionate distribution of scores is observed in all the IITs w.r.t three types of quality level criteria. If we see a consolidated score from all IITs for various categories of Information, it is observed that, Web-centric aspects (138) dominates other two i.e. E-Resources features with 99 score and E-Services features score having 81 points. This shows that though the resources are rich and web design features are well planned and established, there seems to be lack of provision of effective use of library services while accessing the desired features. An attempt is also made to correlate the year of establishment of IITs with their quality level scores. It is generally observed that old IITs with years of establishment from 1951 to 1994 have top ranks from 1 to 4, except Guwahati (1994) with 10th rank. New IITs ranging from the year of establishments 2001 to 2012 have lower ranks with more than 5th in order, with exceptions of Gandhinagar and Bhubaneswar IITs which have 2nd and 4th rank respectively. However, this trend may not be generalised in absence of other factors like resources, requisite manpower, financial aspects etc.
7. DISCUSSION

A number of web design features checklists have been developed e.g. by Nielsen (2005), and Keeker (1997). There is also a practice of best web page awards (Farrell, 1999) yet there is no universally agreed upon specific features to be adopted and developed by the web designers. Kano’s model, however, gives us freedom to continuously review the features at three quality levels dimensions which are independent of any terminological and consistency aspects since the three levels would always be present irrespective of type of website (commercial or academic), and levels of users. However there may be some variations in perceived satisfaction level of users e.g. for a new and first time visitor features under the scope of ‘Normal’ quality level may qualify for ‘Exciting’ level and for an expert website visitor, the perception of an ‘Exciting’ level feature may be a ‘Normal’ level feature. Similarly it holds good for third level of Quality i.e. ‘Basic’ level. It seems Kano’s model has not been applied to LIS sector and particularly for IITs which has far reaching implications for research and practice.

REFERENCES

I

E JOURNAL CONSORTIA IN INDIA: INNOVATIVE STRATEGIES FOR 2020

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ABSTRACT

Consortium is an effort to pool or share resources among member libraries. This paper briefly describes existing e-journals consortia in India and their scope & services. Most important benefit of consortia is saving of financial resources through publishers deep discount policy. It explains in details about DRDO consortia. DESIDOC is the nodal agency that administers and monitors the access/subscription on behalf of DRDO. It provides online access of E-journals for all DRDO labs as per the requirement and recommendation of the Monitoring Committee. The DRDO E-Journal Service came into effect w.e.f. 01 January 2009 covering ten publishers and one service provider. Total ten publishers and one service provider covered by this consortium are ACS, ACM, AIAA, ASME, Elsevier, IEEE, Nature, Science, Taylor & Francis, Jane’s and JCC. All 55 DRDO labs covered are using this service. Recently it has started providing online access of E-journals from, Anywhere & Anytime to all DRDO Scientific Community on 24x7 basis using OpenAthens an access management system. Suggests innovative ideas including implementation of single license SUSHI compliance agreement for all publishers, pay per article models, archiving permission, renewal/subscription of e-journals service, downloading, compilation and analysis of usage statistics, supply of full text information services, conducting workshops, training/awareness programmes regularly for awareness generation for increased use, and a feedback management system, etc. for qualitative improvement in services to users in the future.

Keywords: Library Networks, Library Consortia, Library resource sharing, DRDO, DESIDOC, e-journals.

1. INTRODUCTION

Defence Research and Development Organisation (DRDO), Ministry of Defence, Government of India, is the largest government-funded research and development organization in India with a chain of over 54 laboratories-establishments spread across the country. It is engaged in carrying out research and development of cutting-edge technologies for protecting the frontiers of the country. It endeavours to develop infrastructure, committed quality manpower and a strong technology base in the country for self-reliance in critical defence technologies and systems by indigenisation and innovation while equipping the armed forces with state-of-the-art weapon systems and equipment.

DRDO has about 7000 active R&D scientists, actively supported by technical and supporting staff. Over the years DRDO has developed a number of products, systems and technologies encompassing aeronautics, armaments, combat engineering, electronics, materials, life sciences, naval systems, and so on. DRDO’s research output in terms of publications compares well with the other leading scientific institutions of the country. DRDO’s innovations and its core competency in knowledge development are functionally access-dependent to latest developments in science and technology by its R&D scientific community (Mooorthy).

DESIDOC is the nodal agency that administers and monitors the access/subscription on behalf of DRDO. It provides online access of E-journals for all DRDO labs as per the requirement and recommendation of the Monitoring Committee. The DRDO E-Journal consortia came into effect w.e.f. 01 January 2009 covering ten publishers and one service provider.

2. WHAT IS LIBRARY CONSORTIA?

Library consortia means co-thinking, co-operation, co-ordination and collaboration amongst libraries for the purpose of sharing commonly subscribed information resources. A library consortia is a group of two or more libraries who agree to cooperate with each other in order to fulfil certain similar needs, usually resource sharing.

3. TYPES OF CONSORTIA

There are many types of consortia. Formation of a particular type of consortium depends upon many factors. Broadly there are the following types of consortia:
(a) Open Consortium: In this type, libraries are free to join and leave as and when they please. All types and sizes of libraries can become its member. Member libraries are usually homogeneous in nature and require cross-sharing of the resources in a specific subject area, example, INDEST Consortium.

(b) Closed Consortium: As the name indicates, this type of consortium is formed by coalition, affiliation, and collaboration among exclusive member libraries. This is not open to outsiders, for example, DAE and IIM Consortia.

(c) Centrally-funded: In this type, a parent body or the coordinating agency will have the financial responsibility for running the consortium. DRDO follows this model. Other examples are CSIR and ICMR Consortia, etc.

(d) Shared Budget: In this type, management of funds and other aspects are handled individually by the member libraries. This is most challenging model for sharing resources. Prominent example is Forum for Resource Sharing in Astronomy and Astrophysics (FORS) consortia.

(e) Publishers’ Initiative: Certain publishers are also encouraging consortium formation by giving a deep discount in prices to the member libraries. For example, Wolters Kluwer and Emeralds’ Publishing Groups.

(f) National Consortium: This is a model perceived at national level which includes member libraries from one country. Example is Sweden and Norway.

(g) International Consortium: The end of these models is international level. This will happen in future, as many publishers arbitrary increase prices to fail library budget planning.

4. CONSORTIA BENEFITS

Some of the important advantages and benefits of the library consortia are as follows:

- Reduce the cost of collection development
- Optimum utilization of funds.
- Deep discounts through joint pricing
- Multi-place & multiusers access, simultaneously
- Electronic archiving is possible
- Availability and monitoring of usage statistics
- Inclusion of audio-visual material make reading/understanding simpler
- Multi resources linkages make research more convenient
- Reduced storage costs
- Options to browse, search, view, download and print articles from Publisher’s site
- Effective document delivery
- A single interface and access point using federated search
- Easy coordination among participating libraries
- Increase the e-journals access base
- Ensures rational in utilization of funds
- Ensure continuous e-journals subscription
- Enhanced visibility/image of the library/Institution
- Results in increased user base
- Solves space, shelving, binding, lending, etc. problems
- Saves the time of the users
- Regularly updating of contents
- Available at the user’s laptop/ desktop (24/7)
- Avoids duplication of collection development
- Convenient search facilities
- Faster document delivery service
- Unlimited access Perpetual access on discontinuation of the service
- Facilitation of the use of common library system
- Facilities to build up digital libraries

5. DISADVANTAGES OF CONSORTIA

- Absence of a printed copy of journals in library
- Requires high initial investments towards licensees and infrastructure
- Requires high negotiating skills
- Unreliable telecommunication links and insufficient bandwidth
- Delayed payment/nonpayment of allotted portion of the cost by participating libraries
- Lack of searchable archiving and back files availability
- Requires regular training of staff and users
- Arbitrary changing policies of govt/funding agency
- Problems like copyright/excess downloads from the publisher.

Table 1: Major Consortia in India

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Name of Consortium</th>
<th>Host of Consortium</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Consortium for E-resources in Agriculture (CeRA)</td>
<td>Indian Council of Agriculture (ICAR), established in 2007</td>
<td>123 agricultural/ Deemed Universities/Research Institutes of the Indian Council of Agriculture (ICAR)</td>
</tr>
<tr>
<td>2</td>
<td>DeLCON Consortium</td>
<td>Department of Biotechnology (DBT), 926 journals, established in 2009</td>
<td>Total 34 members (16 DBT Institutions and ICGEB, New Delhi and also 18 North Eastern Region (NER) Institutions)</td>
</tr>
<tr>
<td>3</td>
<td>DRDO Consortium</td>
<td>DESIDOC, established in 2009</td>
<td>54 DRDO Labs</td>
</tr>
<tr>
<td>4</td>
<td>ERMED Consortium</td>
<td>National Medical Library, established in 2013</td>
<td>72 Government Medical Colleges/Institutes including ICMR affiliated research institutes</td>
</tr>
<tr>
<td>5</td>
<td>FORSA Consortium</td>
<td>Indian Institute of Astrophysics, established in 2002</td>
<td>11 institutions including TIFR, PRL, IUCAA, etc.</td>
</tr>
<tr>
<td>6</td>
<td>IIM Consortium</td>
<td>IIMs, established in 2000</td>
<td>All IIMs</td>
</tr>
<tr>
<td>7</td>
<td>INDEST-AICTE Consortium</td>
<td>MHRD/IIT, Delhi, 3 types membership: Type I: Core members supported by MHRD Type II: AICTE supported members Type III: Self-supported members, established in 2003</td>
<td>48 institutions including IISc, IITs, NITs, IIMs ,1096 associate members</td>
</tr>
<tr>
<td>8</td>
<td>MCIT Library Consortium</td>
<td>Ministry of Communications and Information Technology, established in 2005</td>
<td>Department of Information Technology (DIT); Department of Tele communication (DOT) and; Department of Post (DOP). Each department also have a few PSU/ Organizations/ Autonomous Bodies</td>
</tr>
<tr>
<td>9</td>
<td>NKRC E-journal Consortium. (CSIR/ DST)</td>
<td>NISCAIR, access to 5,000+ e- journals, established in 2002</td>
<td>National Knowledge Resource Consortium (NKRC) is a network of libraries and information centres of 39 CSIR and 24 DST institutes.</td>
</tr>
<tr>
<td>10</td>
<td>N-LIST Consortium</td>
<td>INFLIBNET Centre, 6000+ e-journals, 97,000+ e-books, established in 2010</td>
<td>All college covered under section 12B/2F of UGC Act and Non Aided Colleges (except Agriculture, Engineering, Management, Medical, Pharmacy, dentistry and Nursing)</td>
</tr>
<tr>
<td>11</td>
<td>RGUHS- HELINET Consortium</td>
<td>Rajiv Gandhi University of Health</td>
<td>All the affiliated colleges of RGUHS</td>
</tr>
<tr>
<td>12</td>
<td>UGC-DAE Consortium for Scientific Research</td>
<td>Department of Atomic Energy, established in 2001</td>
<td>36 institutions including BARC, TIFR and SAMEER</td>
</tr>
<tr>
<td>13</td>
<td>UGC-INFONET Digital Library Consortium</td>
<td>INFLIBNET Centre, established in 2004</td>
<td>433 members including Universities</td>
</tr>
</tbody>
</table>

6. DESIDOC’S INITIATIVE

At DRDO, each lab/estt has an independent and well established library/information centre, these information resources are complemented by Defence Scientific Information and Documentation Centre (DESIDOC), a constituent establishment of DRDO. The total expenditure by the DRDO laboratories towards procurement of journals hovers over 22 crores per annum. Looking the developments in national and international scenario and the success of INDEST-AICTE and CSIR-DST consortia, in a meeting the multifarious information
requirements of their users, DRDO consortia was initiated. Major consortia initiatives in India are listed in Table 1.

DESIDOC in the year 2007 took up the task for establishing a mechanism for providing online access on a consortium mode to e-journals across all labs/estts. An analysis revealed that 1676 unique titles were being subscribed by the DRDO laboratories from 417 publishers. Among these, 964 titles were subscribed by only one laboratory, 238 each by two laboratories and 124 each by three laboratories; about 60 titles were highly popular with 10 to 40 laboratories subscribing to these. From these, S&T journals of 25 publishers were short listed based on the number of titles subscribed across DRDO labs. A proposal was submitted in 2008 for subscription of about 770 unique titles covering 18 publishers. A Committee constituted for reviewing the proposal recommended 13 publishers. Request for proposals were invited from all the 13 publishers, but 3 publishers did not respond/responded late. Negotiations were held with supply of journals from 10 publishers. DRDO Consortia status in 2014 is presented in Table 2.

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Publisher</th>
<th>No of Journals</th>
<th>Subscribed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IEEE</td>
<td>Full Package</td>
<td>All labs</td>
</tr>
<tr>
<td>2</td>
<td>Elsevier (Science Direct)</td>
<td>197</td>
<td>42 labs plus DESIDOC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>complementary access</td>
</tr>
<tr>
<td>3</td>
<td>AAAS/Science</td>
<td>01</td>
<td>11 labs</td>
</tr>
<tr>
<td>4</td>
<td>ACM</td>
<td>Full Package</td>
<td>5 labs plus DESIDOC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>complementary access</td>
</tr>
<tr>
<td>5</td>
<td>AIAA</td>
<td>07</td>
<td>10 labs</td>
</tr>
<tr>
<td>6</td>
<td>ASME</td>
<td>10</td>
<td>10 labs</td>
</tr>
<tr>
<td>7</td>
<td>IHS Jane’s</td>
<td>05</td>
<td>10 labs</td>
</tr>
<tr>
<td>8</td>
<td>Nature Publishing Group (NPG)</td>
<td>15</td>
<td>28 labs plus DESIDOC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>complementary access</td>
</tr>
<tr>
<td>9</td>
<td>Taylor &amp; Francis Group (T&amp;F)</td>
<td>51</td>
<td>23 labs</td>
</tr>
</tbody>
</table>

**7. NEW INITIATIVES & STRATEGIES**

**7.1 Deep Discount Policy (DDP)**

If DRDO consortia is subscribing to publisher’s complete e-journal package then the copies of those journals in print form is available at only 35% of the original price. Flat 75% discount will be given to those print copies and it is called Deep Discount Policy.

**7.2 Remote Access**

The remote access is a mechanism that enables the access of DRDO e-resources anywhere, anytime to the authorised users of DRDO scientific community and removes the barrier of IP restriction. The facility uses Open Athens which replaces the multiple usernames and passwords necessary to access multiple subscription based content with a single user name with password that can be entered once per session by an individual. This system operates independently of a user's location or IP address. This service is available to authorised users only.

Once a user is registered with Open Athens he/she would be getting a link on his/her mail from eduserv. The user will be provided with the respective username above the link and the password will be given in the end of the link in form a code. The user is required to enter the username and password for remote access login that will direct him/her to the Open Athens main page where all the e-resources he/she might be getting related to his/her interest. This service was implemented w.e.f. 1st July 2013 and have resulted in over 22% increase in e-journal usage by DRDO Labs through registration of 2450 new user accounts at 46 labs/estts. DRDO consortia service is now available even to remotely located DRDO units and also beyond the lab premises/working hours.

**7.3 Feedback Management System**

Feedback Management System (FMS) is a mechanism which will manage all complaints/requests/feedback of lab users, publishers and administrator. Online facility is being given to the lab users for registering the
complaints/requests which will be processed by administrator/publisher. The FMS is fully centralised and controlled by DESIDOC as administrator. The results are listed in Table 3.

Table 3: Feedback from consortia users

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Question asked to users</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>No Reply (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Do you find E-journal service useful for your project?</td>
<td>83.33</td>
<td>0</td>
<td>16.67</td>
</tr>
<tr>
<td>2.</td>
<td>Do you get timely response from DESIDOC to your queries?</td>
<td>66.67</td>
<td>0</td>
<td>33.33</td>
</tr>
<tr>
<td>3.</td>
<td>Do you find any problem in accessing E-journals service?</td>
<td>16.67</td>
<td>72.22</td>
<td>11.11</td>
</tr>
<tr>
<td>4.</td>
<td>Do you require any awareness/training programme?</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>Do you have an internet facility on Desktop?</td>
<td>77.78</td>
<td>16.67</td>
<td>5.55</td>
</tr>
<tr>
<td>6.</td>
<td>Would you prefer print journals in place of E-journals?</td>
<td>22.22</td>
<td>72.22</td>
<td>5.56</td>
</tr>
</tbody>
</table>

7.4 Addition/Deletion/Swapping of e-journal titles

The publishers on negotiations with DRDO management have agreed to add or delete subscribed e-journal titles in a multi-year contract. The publishers have also agreed to move subscription of particular e-journal(s) from one DRDO lab to another lab, without any financial obligations.

7.5 Achieving of Subscribed Content

Many publishers have on negotiations agreed to enable us to legally download the subscribed content in the subscribing/host DRDO lab. This will help us to use the content during unexpected happening in the future. We are also able to avoid dependency of publishers after post cancellation access or any force major issue. DESIDOC has now downloaded/migrated lakhs of subscribed articles from Elsevier (Science Direct) and IEEE databases.

7.6 Implementation of Single License Agreement/ SUSHI Compliance

A platform for automated harvesting of usage of e-journals has been setup for implementation of single license agreement for all publishers under DRDO E-journal consortium. Majority of the publishers have agreed to the single license agreement. This has also lead to increased financial security and saving of money by releasing payment to publishers quarterly. Seven publishers have been successfully integrated with SUSHI client.

7.7 Marketing/Promotion of Library Consortia

Marketing and promotion is the most important activity after subscribing to e-journals. This can be done by:

- Use of posters, case-study sessions, user conventions, etc.
- Training programmes/annual meets at DRDO labs/estts
- Meeting of consortium users group in each lab/estt
- Users convention in member institutions
- Development of consortia web site at a centralised place
- Development of easy to understand tutorials on each e-resource
- Development of Do and Don’ts: IPR and license agreements
- Development of FAQ lists
- Downloadable list of journals with URLs
- Development of consortia website link with library OPAC
- Listing details of subscription period /status /renewal due

7.8 Training of Library Staff and Users

Systematic training would make library officers/staff more competent enabling them to provide qualitative services to the users. “On-the-job” training programmes are better for benefits users but it also solves many localized technological problems that can be solved only with the availability of database retrieval experts at the time of imparting training. DRDO has also conducted a few training programmes for users.

7.9 Online Tutorials

The online tutorials, developed by publishers, for users help, are available on DRDO website, and are listed in Table 4:
Table 4: Online Tutorials on DRDO Website

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Databases</th>
<th>Tutorials Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IHS Jane’s Guide</td>
<td>IHS_Jane’s_Guide</td>
</tr>
<tr>
<td>2.</td>
<td>IHS Jane’s</td>
<td>IHS_Jane’s_Online_What’s_New</td>
</tr>
<tr>
<td>3.</td>
<td>J Gate</td>
<td>J-GATE_CONSORTIA_MANUAL</td>
</tr>
<tr>
<td>4.</td>
<td>Elsevier (Science Direct)</td>
<td>ScienceDirect_Quick_Reference_Guide</td>
</tr>
<tr>
<td>5.</td>
<td>IEL Digital Library</td>
<td>IEEE_Xplore_Overview</td>
</tr>
<tr>
<td>6.</td>
<td>IEL Digital Library</td>
<td>IEEE_Xplore_User_Guides</td>
</tr>
<tr>
<td>7.</td>
<td>Science Magazine</td>
<td>DRDO_E-Journals_Database_Design_v2</td>
</tr>
<tr>
<td>8.</td>
<td>IHS Jane’s</td>
<td>4784_0214TS_IHS_Janes_Online_User_Guide_v5</td>
</tr>
<tr>
<td>9.</td>
<td>IHS Jane’s</td>
<td>4784_0214TS_IHS_Janes_Online_User_Guide_v5_PRESS</td>
</tr>
</tbody>
</table>

8. MAJOR CONCERNS

- Consortia can result, only if there is team work - trust, openness and honesty among member libraries. This is certainly developing, but at a slow pace.
- Today the major concerns in consortia implementation are unstable pricing, clarity on fair use, psychology of owning is in decline with very slow pace, monopoly of publishers, etc.

9. SUGGESTIONS

- DRDO has organised 14 Monitoring Committee meeting of DRDO E-journals Service till 2014, however more such meetings should be organised more regularly.
- Only 10 Training/ awareness program on DRDO E-journals services have been organized till date. Theseshould be conducted more regularly across country and at all DRDO labs.
- Efforts should be made for building/using in-house federated search engine to help users to make a search through single window.
- The librarian and staff members should conduct orientation/training programmes for users more regularly and at different places.
- There is a strong need to evaluate consortia use periodically, and also to include more number of journals from more publishers in the consortia.
- Value added service through e-journals (consortia) using RSS type of feed should be made available to all DRDO users.

10. CONCLUSIONS

DRDO consortia was established primarily on the bases a necessity felt by the Heads of DRDO Libraries/Technical Information Centres. This was discussed in length in a meeting held on 12 December 2006. Today total 10 publishers and one service provider covered by this consortia are ACS, ACM, AIAA, ASME, Elsevier, IEEE, Nature, Science, Taylor & Francis, Jane’s and JCCC. DESIDOC will continue to administer and monitor the access/subscriptions on behalf of DRDO. DESIDOC will continue to collect the feedback from all the participating labs in terms of availability of service, usage statistics and any other problem regarding service and will pay centrally for online journals under consortia, on behalf of DRDO. Unlike academic consortia’s where the institutions are all have a common focus, to support faculty and students, in DRDO each laboratory has different mandate and thus the focus requires a different set of journals. Already DRDO laboratories are having greater resource sharing amongst them and providing increased access to latest R&D developments on 24 by 7.

ACKNOWLEDGEMENTS

I would like to express my deep gratitude to Dr RP Tripathi, Outstanding Scientist and Director, INMAS for encouraging and supporting me in all endeavors at work place. I am thankful to ShYogesh Modi, Head, E-journals Consortium Group, DESIDOC for his valuable and constructive suggestion for this research work and members of his technical team Mr. Ravi Karan Sahuand Ms Faizul Nisha for their help tome for compilation of statistical data.
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SUPPLIER CATEGORIZATION USING MCDM & CLUSTER ANALYSIS TECHNIQUES: AN APPLICATION FROM INDIAN AUTOMOBILE MANUFACTURING FIRM

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ABSTRACT

Manufacturing is complex and necessitates to integrate large number of internal and external factors. Manufacturing changes slowly and it takes a long time to build new facilities, install new equipments, change operating procedures, train personnel and develop new suppliers. Manufacturing outputs of a firm depend on various parameters including the production workforce, technology used, quality assurance and the reliability of the suppliers. Supplier involvement in meeting the objectives of a firm is of paramount importance. One of the most critical strategic decisions of a firm is the selection of the right suppliers which can align its capabilities and outputs with the levels desired. In literature many studies have been carried out for supplier selection process. But there is a gap in supplier’s evaluation and development process. There is a need to develop an effective mechanism which can help the manufacturing firm to evaluate their current suppliers and to classify them on the basis of their performance. In the present work, this motive is achieved by the application of Multi criteria decision making techniques and cluster analysis, to categorise the current suppliers of an automobile manufacturing firm into similar sets or groups, with an aim to develop strategies for each group.

Keywords: Manufacturing strategy, Supplier evaluation, Multi-criteria decision making, Cluster analysis.

1. INTRODUCTION

Firms in most industries use strategic partnerships to achieve competitive advantage in local and international markets. This is primarily to align and regulate the firm’s strategies against competitive challenges in order to achieve its strategic goals. Suppliers have always been an integral part of a firm’s management policy. To ensure that a firm can run as it should, it needs to ensure the seamless flow of supplies of right quality in right quantity at right price and at the right place. Supplier management is vital for determining and developing an effective supply-chain link. It has to be optimised in order to achieve the objectives of an effective supply chain mechanism. Supplier selection is a strategic decision making process which has long term implications on the profitability and growth of a firm. When firms are allocating more resources to their core competencies and encouraging the outsourcing of non-core activities they have more reliance and dependence on suppliers. Thus to limit financial, business and reputation risk, it is crucial for the manufacturing industries to effectively and efficiently evaluate suppliers. Suppliers’ evaluation is a process that enables organizations to control costs, drive service excellence and mitigate risks to gain increased value from their vendors throughout the product life cycle.

In literature lot of research has been carried for supplier selection process. Many supplier selection decision making studies have been done to evaluate and select suppliers. Study on Supplier selection using Multi-Criteria decision making techniques has gained popularity. AHP process for supplier selection was carried by Butul Ozkan et al 2011, with an application from Turkey to choose the best suppliers for computer and printer purchasing for General Directorate of Land Registry. Coskun Ozkan at el, 2011 have focused on evaluating current suppliers, in order to determine which vendor are involved in design decisions and product development process. They proposed a fuzzy Art methodology to evaluate the suppliers. Many authors have compared AHP and TOPSIS methods to supplier selection. Francisco Rodrigues et al, 2014 have conducted a comparative study between Fuzzy AHP and Fuzzy TOPSIS methods to supplies selection to help researchers and practitioners to choose more effective approach for supplier selection. This study was applied to the selection of suppliers of a company in the automotive production chain. Jia-Wen et al, 2008 simplifies the complicated metric distance method using ranking fuzzy number by metric distance method and proposes an algorithm to modify Fuzzy TOPSIS method for supplier selection. The literature is silent of the evaluation of the current suppliers. By developing and implementing an effective evaluation mechanism, the management of the firm can evaluate the health of their suppliers. The idea represented in this work is that once relations have been built up with suppliers then it is important to keep on tracking the performance of the suppliers to ensure the objectives are being met effectively and efficiently.

2. MCDM TECHNIQUES

Analytic Hierarchy Process (AHP) is one of the Multi Criteria decision making method that was originally developed by Prof. Thomas L. Saaty. AHP addresses how to determine the relative importance of a set of activities in a multi-criteria decision problem. It is a method to derive ratio scales from paired comparisons. The input can be obtained
from actual measurement of criteria or from subjective opinion such as satisfaction feelings and preference. AHP allow some small inconsistency in judgment because human is not always consistent. The ratio scales are derived from the principal Eigen vectors and the consistency index is derived from the principal Eigen value. The process makes it possible to incorporate judgments on intangible qualitative criteria alongside tangible quantitative criteria.

The AHP method is based on three principles: first, structure of the model; second, comparative judgment of the alternatives and third, the criteria, synthesis of the priorities. In the first step, a complex decision problem is structured as a hierarchy. AHP initially breaks down a complex multi-criteria decision-making problem into a hierarchy of interrelated decision criteria, decision alternatives. With the AHP, the objectives, criteria and alternatives are arranged in a hierarchical structure similar to a family tree. A hierarchy has at least three levels: overall goal of the problem at the top, multiple criteria that define alternatives in the middle, and decision alternatives at the bottom. The second step is the comparison of the alternatives and the criteria. Once the problem has been decomposed and the hierarchy is constructed, prioritization procedure starts in order to determine the relative importance of the criteria within each level. The pair-wise judgment starts from the second level and finishes in the lowest level alternatives. In each level, the criteria are compared pair-wise according to their levels of influence and based on the specified criteria in the higher level. In AHP, multiple pair-wise comparisons are based on a standardized comparison scale of nine levels.

Let \( C = \{ c_j | j = 1, 2, ..., n \} \) be the set of criteria. The result of the pair-wise comparison on \( n \) criteria can be summarized in an \((n \times n)\) evaluation matrix \( A \) in which every element \( a_{ij} (i, j = 1, 2, ..., n) \) is the quotient of weights of the criteria, as shown:

\[
A = \begin{bmatrix}
    a_{11} & a_{12} & \cdots & a_{1n} \\
    a_{21} & a_{22} & \cdots & a_{2n} \\
    \vdots   & \vdots   & \ddots & \vdots   \\
    a_{n1} & a_{n2} & \cdots & a_{nn}
\end{bmatrix}
\]

\( a_{ii} = 1, a_{ii} = 1/a_{ij}, a_{ij} \neq 0 \).

At the last step, the mathematical process commences to normalise and find the relative weights for each matrix. The relative weights are given by the right eigenvector \( (w) \) corresponding to the largest Eigen value \( \lambda_{max} \) as: \( A_w = \lambda_{max} W \).

If the pair-wise comparisons are completely consistent, the matrix \( A \) has rank 1 and \( \lambda_{max} = n \). In this case, weights can be obtained by normalizing any of the rows or columns of \( A \). It should be noted that the quality of the output of the AHP is strictly related to the consistency of the pair-wise comparison judgments. The consistency is defined by the relation between the entries of \( A : a_{ij}A_{kj} = a_{ik} \). The consistency index CI is:

\[
CI = (\lambda_{max} - n)/(n-1)
\]

The final consistency ratio (CR), usage of which let someone to conclude whether the evaluations are sufficiently consistent, is calculated as the ratio of the CI and the random index (RI)

\[
CR = CI/RI
\]

The consistency ratio should be less than 0.1. The Satty scale for evaluation of pair-wise comparison and value of random Index for matrix size is as follows:

<table>
<thead>
<tr>
<th>Definition</th>
<th>Intensity of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equally important</td>
<td>1</td>
</tr>
<tr>
<td>Moderately more important</td>
<td>3</td>
</tr>
<tr>
<td>Strongly more important</td>
<td>5</td>
</tr>
<tr>
<td>Very strongly more important</td>
<td>7</td>
</tr>
<tr>
<td>Extremely more important</td>
<td>9</td>
</tr>
<tr>
<td>Intermediate more important</td>
<td>2, 4, 6, 8</td>
</tr>
</tbody>
</table>

**Table 1. Satty Scale**

<table>
<thead>
<tr>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>0</td>
<td>0</td>
<td>0.58</td>
<td>0.9</td>
<td>1.12</td>
<td>1.24</td>
<td>1.32</td>
<td>1.41</td>
<td>1.45</td>
</tr>
</tbody>
</table>

**Table 2. Value of Random Index**

**TOPSIS Technique**

Technique of preference using similarity to idle solution is yet another powerful mathematical technique used for determining the weight-age of different conflicting criteria. The TOPSIS process is carried out by application of following steps:

Step 1

Create an evaluation matrix consisting of \( m \) alternatives and \( n \) criteria, with the intersection of each alternative and criteria given as \( x_{ij} \), we therefore have a matrix \( (x_{ij})_{m \times n} \).
Step 2
The matrix \((X_{ij})_{m \times n}\) then normalized to form the matrix
\[ R = (r_{ij})_{m \times n} \] using the normalization method
\[ r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}, \quad i = 1, 2, \ldots, m, \quad j = 1, 2, \ldots, n \]

Step 3
Calculate the weighted normalized decision matrix
\[ T = (t_{ij})_{m \times n} = (w_{j} r_{ij})_{m \times n}, \quad i = 1, 2, \ldots, m \]
\[ w_{j} = W_{j} / \sum_{j=1}^{n} W_{j}, \quad j = 1, 2, \ldots, n \]
\[ \sum_{j=1}^{n} w_{j} = 1 \]
Where \(w_{j}\) so that \(w_{j}\), and \(W_{j}\) is the original weight given to the indicator
\(v_{j}, \quad j = 1, 2, \ldots, n\).

Step 4
Determine the worst alternative \(A_{w}\) and the best alternative \(A_{b}\):
\[ A_{w} = \{ \max (t_{ij} | j = 1, \ldots, n) | j \in J_{+} \} \equiv \{ t_{wj} | j = 1, \ldots, n \}, \]
\[ A_{b} = \{ \min (t_{ij} | j = 1, \ldots, n) | j \in J_{-} \} \equiv \{ t_{bj} | j = 1, \ldots, n \}, \]
where,
\(J_{+} = \{ j = 1, \ldots, n | j \} \) associated with the criteria having a positive impact, and
\(J_{-} = \{ j = 1, 2, \ldots, n | j \} \) associated with the criteria having a negative impact.

Step 5
Calculate the L2-distance between the target alternative \(z\) and the worst condition \(A_{w}\)
\[ d_{w} = \left( \sum_{j=1}^{n} (t_{w} - t_{wj})^2 \right)^{1/2}, \quad i = 1, 2, \ldots, m \]
and the distance between the alternative \(z\) and the best condition \(A_{b}\)
\[ d_{b} = \left( \sum_{j=1}^{n} (t_{b} - t_{bj})^2 \right)^{1/2}, \quad i = 1, 2, \ldots, m \]
where \(d_{w}\) and \(d_{b}\) are L2-norm distances from the target alternative \(z\)to the worst and best conditions, respectively.

Step 6
Calculate the similarity to the worst condition:
\[ s_{w} = d_{w} / (d_{w} + d_{b}), \quad 0 \leq s_{w} \leq 1, \quad i = 1, 2, \ldots, m \]
\[ s_{w} = 1 \] if and only if the alternative solution has the best condition; and
\[ s_{w} = 0 \] if and only if the alternative solution has the worst condition.

Step 7
Rank the alternatives according to \(s_{w}(i = 1, 2, \ldots, m)\).

3. CLUSTER ANALYSIS
Cluster analyses is an analytical approach which enables pattern discovery in a set of data. It is the task of grouping a set of data in such a way that objects which lie in the same group (called a cluster) are more similar to
each other than to those in other groups or clusters. The goal of Cluster analyses is to built a typology using
information from a set of data. Clustering is generally performed by clustering algorithms. One of the primary
motivations for clustering is discovering previously unknown groups inside a data set. Objects within a cluster
are “similar” to one another; wherein similarity is calculated or derived in terms of “closeness” i.e. how close two
objects are in space. This is done by using specific distance function.

**Clustering Methods**

Clustering methods can be classified into the following categories –

- Partitioning Method
- Hierarchical Method
- Density-based Method
- Grid-Based Method
- Model-Based Method
- Constraint-based Method

The Characterization method employed by us is inspired by density based method of cluster analysis. One of
the primarily reasons for using this method is the nature of data we encountered and the number of clusters we
intend to formulate. The results of using this method were more appropriate. In this process, some random
points are selected to start categorization. The points search for similar values in its neighborhood till the
minimum numbers of points are grouped in one cluster. If two starting points are grouped in one cluster, we
select new point randomly and start grouping again. This process continues until all points are categorized in
one or other cluster eventually. The results are achieved by using SPSS software.

**Density Based Clusters**

Clusters may be looked at as dense regions in the data space; where clusters are separated by a space region
containing “relatively few” data. Given this assumption, a cluster can either be of “regular” or “arbitrary” shape.
Some of the common density based clustering techniques are DBSCAN, OPTICS, VDBSCAN, DVBSCAN,
DBCLASD, ST- DBSCAN and DENCLUE.

### 4. APPLICATION OF AHP & TOPSIS TO SAMPLE ORGANIZATION

The sample organization taken as a case study is a reputed manufacturer of automobiles in North India. The name
of the organization is not revealed in this paper due to confidentiality. The percentage market covered by this
firm is very large as compared to other manufacturers of the region. As in most of other automobile
manufacturing industries, the organization receives various parts, sub-assemblies, materials, ancillary items
and other direct and indirect materials from the vendors. These are then used in the assembly process.
Consequently, the manufacturing output of the firm is very much reliant on its suppliers. Hence, a highly
efficient performance is demanded from the suppliers to compete effectively and meet the challenges of the
market. A winning competitive strategy is grounded in competitive advantage. The various criteria selected after
through literature survey, for the evaluation and categorization of suppliers are as following:

#### 4.1 CRITERIA

**4.1.1 Quality (C₁)**

Quality in its most simple terms may be defined as “Conformance to requirements”. A product is said to be of good
quality if it works well in the equipment it was meant for. In manufacturing firms, quality is a measure of
excellence or a state of being free from defects, deficiencies and significant variations. It is brought about by strict
and consistent commitment to certain standards that achieve uniformity of product in order to satisfy specific
customer or user requirements. If an automobile company finds a defect in one of their cars and makes a product
recall, customer reliability and therefore production will decrease because trust will be lost in the quality of the
product. There are 3 stages in consideration of ‘Total Quality’ of any product:-

*Quality of Design*: It is concerned with the tightness of the specifications for the product. (For e.g. a part having a
drawing tolerance of 0.001 mm is of better quality than a part having a tolerance of 0.01 mm.)

*Quality of Conformance*: It is concerned with how well the manufactured product conforms to the quality of
design. *Quality of Performance*: It is concerned with how well the manufactured product gives its
performance. It depends on quality of Design and quality of Conformance.
4.1.2 On-time delivery ($C_2$)

The delivery criteria comprises of delivery time and deliver time reliability. Delivery time is the amount of time a supplier requires to supply a product to the manufacturing firm. On-time delivery is a criteria used to assess the ability of supplier to fulfill shipping order within the period of time promised. The parameters to be measured while evaluating on-time delivery are ship date, dock date, promised date, required date, original promised date, revised promised date, purchaser and supplier data, percentage of line item or percentage of quantity ordered.

4.1.3 Cost ($C_3$)

Each product a supplier produces has a cost. A low cost makes a low price possible and provides a better opportunity for profit than a high cost. While a straightforward concept, product cost can be difficult to measure accurately when manufacturing's large overheads need to be allocated. The most important cost is relative to the other manufacturing outputs, the more important it is to have a cost accounting system that measures it accurately.

4.1.4 Technical capabilities ($C_4$)

The ability of the supplier to technically comprehend and convert the requisite demand into tangible product of desired specifications and tolerance limits is considered as the technical capability of a supplier. The rapid pace of introduction and deployment of new technologies has contributed to the increased importance of an evaluation of the technical capability of a prospective vendor in the supplier selection decision problem. The buyer is not only concerned about the current technology utilized by the supplier but also about its future technological capability. The technical capability of a supplier can be gauged in terms of scientific background, engineering background, skills, mechanical and system capabilities, electronic capabilities, application engineering capabilities, etc.

4.1.5 Flexibility ($C_5$)

Flexibility is the ability to bend and blend to an immediate change. Flexibility for a supplier is the ease with which the supplier can respond to uncertainty in a manner to sustain or increase its value delivery. Uncertainty is a key element in the definition of flexibility. It can be measured keeping in view the following:

- Machine flexibility.
- Material handling flexibility.
- Operation flexibility.
- Process flexibility.
- Product flexibility.
- Routing flexibility.
- Volume flexibility.
- Market flexibility.
- Production flexibility.

4.1.6 Reputation ($C_6$)

Reputation of a supplier is an opinion about that supplier, typically a result of social evaluation on a set of criteria. It may be considered as a component of identity as defined by others. Media, press release, blogs, forums, advertisement and websites play a major role in reflecting the reputation of a supplier. High reputed suppliers may ensure meeting the desired characteristics.

4.1.7 Product performance (Reliability) ($C_7$)

Quality of an item is associated with conformance to specifications and critical customer expectation. Reliability may be defined in the following ways:

- The idea that an item is fit for use with respect to time.
- The capacity of a designed, produced, or maintained item to perform as required over a period of time.
- The capacity of a population of designed, produced or maintained items to perform as per requirement over a specified time.

4.1.8 Geographic location ($C_8$)

The geographic location of a supplier should be convenient enough for the supplied items to reach on time and in good condition. Generally companies have their supplier within a radius of few kilometers so as to keep the production of items going. With the advances in logistics and information technology, business has transcended geographical boundaries. The globalization of the world economy has resulted in an increase in the number of firms that have shifted their concentration on domestic sourcing to development of supplier bases around the world. As information technology continues to introduce more advanced means for closer coordination of supply chains, we can anticipate further reduction in the importance of the geographic location of the vendor in the supplier selection decision problem.
4.1.9 Innovation (C9)

Innovation is the ability to produce new products. It is a new idea, more effective device or process. Innovation can be viewed as the application of better solutions that meet new requirements, unarticulated needs, or existing market needs. This is accomplished through more effective products, processes, services, technologies, or ideas that are readily available to markets, governments, and society. Suppliers with adaptation to innovativeness are supposed to have good reputation.

4.1.10 Relationship (C10)

The buyer-seller relationship evolves across five stages: pre-relationship stage, exploratory stage, development stage, stable stage, and final stage. This evolution depends on variables like experience, uncertainty, distance, and commitment. Uncertainty and lack of trust, power difference, deviations from agreements, institutionalized patterns of operation and distance between buyers and sellers lead to conflicts. These conflicts can be resolved through persuasion, compromise, negotiation, and bargaining.

4.1.11 Education & training (C11)

The performance of a supplier is also affected by the quality of education and training it provides to its employees. Any company should have in-house training departments, annual training plans and assessment tasks for managers, supervisors, quality inspectors, and other people. The training records should be maintained on a timely basis to keep a check on skills of employees.

4.1.12 Financial situation (C12)

An assessment of the financial stability and fiscal outlook of the supplier is a factor gaining in importance in the growing trend of forging supplier-buyer partnerships. Both buyers and sellers are looking for partners that are viable, ongoing concerns that will contribute to the relationship both for the present and in the future. A supplier on financially unstable footing will have much more difficulty contributing to the partnership venture, as it must focus its efforts on improving its financial soundness. Hence, both suppliers and buyers are becoming more mindful of the financial position of their potential partners in their decision making.

![Image](image_url)

Figure 1. Criteria for suppliers evaluation

5. Data Collection and Analysis

Questionnaires were developed for pair wise comparison of criteria and pair wise comparison of suppliers for each criterion. The survey was conducted in the firm by administrating the questionnaires among various concerned officials in the supply chain department. The response was obtained from top, middle, and junior managers. After obtaining the data, data analyses was carried out and various calculations were done.

Calculations

The AHP uses mathematical calculations to convert these judgments to priorities for each of the twelve criteria. The details of the calculations are beyond the scope of this paper but the sample calculations are presented in the annexure. The software also calculates a consistency ratio that expresses the internal consistency of
the judgments that have been entered. The data obtained from a well designed and well understood questionnaire was entered into AHP algorithm to obtain weights for the criteria and sub-criteria for each of the 20 suppliers. MATLAB program was developed for obtaining the output. The matrix solution at the first level is the solution of pair-wise comparison of 12 criteria, i.e. a 12 cross 12 matrix. At second level, for sub-criteria of each main criterion, matrix solution is again obtained. Thus the weight-ages of each criteria is obtained.

Now, in the third level, the matrix solution yields weights of suppliers. All the solutions (Weight-age) obtained are simultaneously checked for consistency to ensure that the pair-wise comparisons are not biased or inconsistent. Finally the matrix between weights of criteria and weights of suppliers is made to gain the overall ranking of suppliers. Also the matrix between weights of sub-criteria and weights of suppliers could be made to gain local ranking of suppliers.

First, it is the comparison matrix calculation of criteria. Secondly there are 12 comparison matrices of suppliers for each of the 12 criteria. Lastly, the matrix is generated to obtain the overall rating of each supplier using the AHP algorithm. It should be noted that for each matrix calculation, the consistency ratio obtained was less than 10 percent, hence our survey was consistent.

6. RESULTS AND CONCLUSION

After selecting the appropriate criteria, based on the manufacturing organizations relevance, questionnaires were developed and administered among the concerned executives of the firm to obtain the response for the suppliers performance. The weigh-age of each criteria was calculated. The data collected was further examined and analyzed by using AHP and then results were compared with TOPSIS. The rank of each supplier as is given in figure 3 was determined. Finally the suppliers were grouped into clusters based on the density based method of cluster analysis as given in table 3. The different clusters gave an insight into the degree of similarities of the vendors when measured on the basis of common criteria. Cluster analysis was used to develop the taxonomy based on the importance scores for the suppliers. The analysis carried out illustrated formation of three clusters. SPSS software was used to obtain the results by feeding the overall ranking (weight-age) of all the 20 suppliers, which placed these suppliers in three distinct groups or clusters. The clusters revealed that those suppliers with high scores (Weight-age) are placed in cluster A followed by suppliers with intermediate ranks which is defined as cluster B and the suppliers with low ratings are placed in cluster C.

Three clusters A, B and C have five, five and ten suppliers clubbed into them respectively. Three clusters A, B and C were identified with five, five and ten suppliers clubbed into them respectively. Suppliers in cluster A are collectively named as "Prominents" since they have high comparative weights. Suppliers in cluster B are named as "Intermediators" on the basis of average comparative weights and similarly suppliers in cluster C are named as "Marginals" on the basis of low comparative weights. The firm needs to develop strategy for the suppliers in these three clusters and take appropriate measures, say for example a "keep it up" approach for cluster A suppliers, "improvement needed" approach for cluster B suppliers and "grow or go" approach for cluster C suppliers. This action will measure the performance of the current suppliers and hence help the firm to recognize their competitive arsenal on the supplier front.

![Weight](image)

**Fig.2. Weight-ages of criteria**

![Supplier weights](image)

**Fig.3 Weight-ages of 20 suppliers**
<table>
<thead>
<tr>
<th>CLUSTER</th>
<th>SUPPLIER</th>
<th>WEIGHTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S1</td>
<td>0.13423</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>0.12901</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>0.117564</td>
</tr>
<tr>
<td></td>
<td>S7</td>
<td>0.10427</td>
</tr>
<tr>
<td></td>
<td>S5</td>
<td>0.093926</td>
</tr>
<tr>
<td>B</td>
<td>S19</td>
<td>0.057453</td>
</tr>
<tr>
<td></td>
<td>S7</td>
<td>0.05455</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>0.053723</td>
</tr>
<tr>
<td></td>
<td>S10</td>
<td>0.04916</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>0.042627</td>
</tr>
<tr>
<td>C</td>
<td>S1</td>
<td>0.039636</td>
</tr>
<tr>
<td></td>
<td>S13</td>
<td>0.02362</td>
</tr>
<tr>
<td></td>
<td>S15</td>
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</tr>
<tr>
<td></td>
<td>S8</td>
<td>0.019277</td>
</tr>
<tr>
<td></td>
<td>S16</td>
<td>0.018558</td>
</tr>
<tr>
<td></td>
<td>S12</td>
<td>0.019942</td>
</tr>
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<td></td>
<td>S6</td>
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</tr>
<tr>
<td></td>
<td>S20</td>
<td>0.01262</td>
</tr>
<tr>
<td></td>
<td>S18</td>
<td>0.009127</td>
</tr>
<tr>
<td></td>
<td>S9</td>
<td>0.009491</td>
</tr>
</tbody>
</table>

Table: Weight ages of 20 suppliers of the automobile firm

**PROGRAM for the Supplier Data Evaluation (TOPSIS)**

```matlab
clc
clear all
close all
fprintf('Supplier Data Analysis by TOPSIS\n');
fprintf('a=';a);
fprintf('Submitted to Assoc. Professor Mr. Saad Parvez\n');
fprintf('r=';r);
ma=supplierdata;
[x]=size(ma);
s=zero(x,1);
for j=1:
for i=1:n

    sum(j,i)=sum(j,1) + ma(i,j)/2;
end
end

for j=1:
t=t(a(i,j));
rj=zero(t,1);
for i=1:

    wij(j)=ma(i,j)/t(a(i),j);
end

    dm=[0.708107,0.054215,0.18625,x,0.135912,0,0.85468,0.007342,0.23756,0,0.02618,0.036756,0.057705,0.010447,0.013926];

    for j=1:

        wij(j)=ma(j)/t(a(i),j).
    end
    A=[max(wij(1),a),max(wij(2),a),max(wij(3),a),max(wij(4),a),max(wij(5),max(wij(6),max(wij(7),max(wij(8),max(wij(9),max(wij(10),max(wij(11),max(wij(12))))))));
    S=max(wij(1),min(wij(2),min(wij(3),min(wij(4),min(wij(5),min(wij(6),min(wij(7),min(wij(8),min(wij(9),min(wij(10),min(wij(11),min(wij(12))))))))))));
    astar=[Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar,Astar];
    sastar=astar/wij;
    sastar(1)=zero(t,1);
    for i=1:

        sastar(i,1)=sastar(i,1) + z(a(i))/2;
    end
end
```

Results of TOPSIS

best_supplier - in descending order of their weights as obtained by TOPSIS programme

S2 S11 S14 S17 S5 S19 S7 S3 S10 S4 S1 S13 S8 S16 S12 S6 S20 S18 S9

which is almost same as AHP results.

**REFERENCES**


CHAT REFERENCE SERVICES IN ACADEMIC LIBRARIES

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ABSTRACT
The purpose of this paper is to discuss Chat Reference services using live virtual reference technology as a reference service provided by librarians and technicians at information and reference desks in academic libraries. The focus is on experiences from different academic libraries around the world and gives an example from the Zayed University, United Arab Emirates, experience of the chat reference.

Experience of chat reference practices in academic environments from a local academic library at Zayed University and international academic libraries as reviewed in the literature such as Purdue University Libraries and University of Nevada are used as examples in this paper.

The importance of the study is in addressing the competencies of chat reference librarians in academic libraries and best practices that other libraries implementing the service may find useful. The critical question is: what are the basic skills needed for chat reference? In addition to finding out the advantages and disadvantages of chat reference, the paper highlights its benefits to a library when it is part of user services. It is also necessary to discover methods of evaluating Virtual Reference Services compatible to international standards from the RUSA, ALA and IFLA associations.

Keywords: Chat Reference Services, Virtual Reference Services, Academic libraries, United Arab Emirates Zayed University

1. INTRODUCTION
The most universal reference resource to emerge in the twentieth century was the Internet. Virtually unknown to the general population until the advent of the World Wide Web in 1990, the explosion of Internet use in less than two decades has been nothing short of spectacular in libraries and other service oriented organizations. The internet is accessible for internal and external use and services, therefore services in libraries need to be kept up to the communication practices of the 21st century. Among the hundreds of remarkable technologies that were adopted for use in reference services is one called Online Chat or Live Chat (LiveChat, 2014). This is an environment where the staff and the users/patrons or customers communicate online via a software as a service model. Chat or Virtual Reference Services are part of library public services that have been developed to meet needs of the changing academic population. Most students are off campus, online courses are being offered not requiring students to be on campus in order to complete their studies. In addition the Internet has provided publishers with an opportunity to publish many resources (books and journal articles) that are now available in digital format online.

Reference services in all its types of libraries functioned a long time ago with a telecommunication feature “telephone” as a tool of communication between library staff and library users before the internet started flourishing. Although many libraries are now making use of the Internet for such services, there are some libraries that do not use internet currently due to various reasons are still relying on email and telephone for their reference services. The internet connects the user/patron and the library through an online platform to communicate virtually, but that cannot take place where there is no online platform, so those libraries have to resort to other ways of communication. This also depends on the e-referencing software capability. The live chat service is not limited to libraries only, but other businesses use it extensively to do various jobs online, for example, some academic institutions are offering online courses, online registration, and delivering basic information; service organizations also use it for ready reference for customers where they address issues about their products. According to Jana Smith (Ronan, 2003) the spectrum of chat software ranges from free or inexpensive software, such as instant messaging (IM) or Internet Relay Chat (IRC) that supports text-based conferencing between two or more users, to sophisticated and often expensive software used in call centers that combines text-based chat with sound, video, white-boarding, Voice Over Internet Protocol (VOIP) and the ability to send users web pages and other files with the needed information. In addition social media tools are being used by some libraries to communicate with their patrons through Twitter, Facebook, Skype and text messaging. The choice is left to the patron to select the most convenient.
2. REFERENCE SERVICES CONCEPT
Reference services are described as the personal assistance and guidance that a librarian or library staff provides to patrons in pursuit of information (Bunge 1999). In this process the patron would ask a question and the librarian will engage in a discussion to find-out more about the information needed. This process is referred to as the Reference Interview, and it is key to understanding the patron’s information need in order to guide them to appropriate resources.

Technically the reference desk started as a librarian helping patrons by using traditional resources such as books, newspapers, encyclopedias, almanacs, bibliographies, dictionaries, journals, atlases (printed materials) available in the library. Then the second generation including telecommunication witnessed telephone reference in addition to carrying on with the relevant reference and print resources. Current developments in most libraries include virtual or chat reference services, using a computer. Such services are also at times referred to as digital reference services. In this paper the three terms will be used interchangeable.

Throughout the development of reference services and the use of various technologies, a reference librarian has been an intermediary between the user and the technology and resources. In all these instances there cannot be service without a human being or excluding the major resources being used to get the right information. Thus, the controversy about reference and information resources without a real person with the advent of electronic books and resources becomes questionable if one considers who would guide patrons to find those resources. Rather than closing library doors, it is important for librarians to continuously revise their service models and demonstrate that there is merit and value in maintaining the human face in reference and information services. It is that regard that one has to discuss some of the software packages used in reference services.

3. SIGNIFICANCE OF THE STUDY
Academic libraries are now at a front line position that requires them to make great efforts and correspond to the needs of the knowledge society. Libraries therefore have to be able to satisfy its requisite needs. There is no doubt that information access and online services have to meet the expected demand, especially in an environment of competition from other information providers that also meet the core needs that support the education of the net-generation students.

There are many challenges facing academic libraries according to the information seekers behavior. Therefore new methods of communication had to be deployed to help libraries continue supporting the users in the academic institutions that provide information and reference services. Taken together and applying them in the academic libraries have led to the need for a new model of technology in the reference services, consequently building good communication system between the library, users and the service provided. This relation is becoming strong and useful in achieving the highest degree of user satisfaction. The current study is thus of value to the Library and Information community as it highlights the new service in assisting library patrons especially in UAE where only six (6) academic libraries are providing Virtual/Chat reference services (researchers observation from academic library Websites October 2015). In addition studies about Chat Reference in academic libraries in the UAE and the Arab world are lacking, hence this will shed some light to what is happening in the region.

4. METHODOLOGY
Methodology used for this research is explanatory case study (Yin 1994) in which Chat/Virtual reference services in academic libraries are being reviewed to find out what and how the services are implemented and how best other libraries may learn from the process. White and Marsh (2006) argue that numerous scholars in Library and Information Science (LIS) studies use content analysis method for its benefits and flexibility. Accordingly the current researchers have used literature review and document analysis to gather and discuss information from previous research about Virtual/Chat Reference in academic libraries, and provide experience through practices from the researchers’ place of work; Zayed University Library and Learning Commons Chat Reference Services. The sources of information used include books, journal articles and library websites as acknowledged in references for this research.

5. LITERATURE REVIEW
Software for Chat Reference
There are various software applications used to facilitate chat reference services. The selection depends on the preference of the library involved, for type of service they want to deliver and having librarians who are technologically savvy and willing to learn, challenge themselves and explore. Literature has revealed that many of the applications are owned by major business companies for which libraries have to subscribe to and pay annual fees, maintenance and training fees, in order to get full services such as co-browsing, sending documents etc. Some of the applications include: Internet Relay Chat (IRC), Instant Messaging (IM), Virtual Reference Toolkit by Tutor.com and Question Point by OCLC (Ghasri & Dehgani2009, , just to mention a few. Recent many academic
libraries use Libchat, provided by SpringShare (researchers’ observation), while some academic libraries are using Skype for video conferencing to provide reference services and file sharing (Beaton 2012).

Advantages and Challenges/Limitations of Virtual/Chat Reference Services

Admittedly, chat reference increases the ways that library patrons can receive library support, additionally chat services have become more popular due to the advantages it accords both library staff and patrons including: Solving responses to user queries in real time hence avoiding the wait.

Time Efficiency- the speed of delivery and completion of the service is fast as patron queries are addressed in real time and much faster unlike email responses. This is also convenient for the library staff as well as patron/user, since both could do other things while waiting for each party to respond. Since conversations are done in writing rather than speech, there would be very little need for repetition as conversations are recorded in a chat box. And both parties can go back and forth reading the transcript for clarification. In addition, patrons may copy and paste chat conversations for future references, or can request a transcript to be send via email. Some Chat software now request the patron if they wish to print the transcript before logging out.

Cost effectiveness is another advantage, the fast paced nature of live chat helps businesses in all its aspects to do more with less. Reference service teams can increase up their productivity with live chat, which can cut costs on hiring extra manpower, as librarians can leave directional questions to be addressed by Technicians and they can concentrate with subject specific in-depth research questions needing a specialist skills and knowledge. Moreover, live chat has the potential to improve resources usage, as shown in a case study by University of Florida (UF) (George Amathers Libraries, 2003), and University of Texas San Antonio (Kemp, Ellis & Maloney, 2015). In UF, the case study user statistics increased during the chat reference hours and illustrates the impact.

Less confrontation, chances of confrontation and misunderstanding including raising voices are reduced. Sometimes users who visit the Reference Services Desk could be angry, as a result of dissatisfaction or pressure to complete a project. Librarians at most of the libraries are at the front lines of receiving a good tongue lashing from users, since angry people generally have a tendency to deliver sharp words and heavy criticism. However, reference service staff members are human beings, with feelings too, and too much negativity can take its toll, making them unhappy and unproductive. Live chat can lessen the impact of this kind of occupational hazard.

Opportunity for collaboration. Chat reference staff may forget details regarding a certain database, policy, or other important detail that a customer requests. To expedite resolutions, librarians may team up by giving each other answers through their individual chat windows. The waiting time for the customer, in this situation, would be minimal since the users will also be using instant messaging.

Limitations and Disadvantages

While everyone is excited about the availability of technology to assist patrons from far and wide, limitations have been observed by chat operators/librarians. These include the necessity to engage the patron requesting services in a live chat; at times librarians find it difficult to keep the visitor engaged while looking for an answer to an unfamiliar query during a chat session. This is where face-to-face interaction is preferable to make it easier to understand the real information requirement of the user. According to Curtis (2004), finding a satisfactory answer to a library reference question does not depend on the time of day. In fact from the way that libraries currently operate, many information resource are now available online 24 hours a day. However, where a university has specific chat hour times, that become problematic for after closing time. Patrons are disappointed to be to learn that services will not be available until the next day. Patrons expect to find answers to their information need at the time of need.

Although Chat Reference Services have been studied for over two decades and guidelines have been developed for effective communication in Virtual Reference Service (Reference and User Services Association (RUSA), ALA & IFLA 2010), little is known about the actual sources of miscommunication in the interactions. Some study uses conversation analytic framework to investigate the types of potential or actual problems in communication that occur between librarians and patrons in chat reference interactions at a university library (Koshik & Okazawa 2012). Conversation analysis methodology, as developed by Sacks, Schegloff, and Jefferson (1974), provides a practical basis for assertions about problems with communication by investigating what the participants themselves display as challenging or potentially difficult. An observation of archived chat reference transcripts, will reveal evidence of types of problems that have occurred during the interaction. Sources of problems that were targeted by both librarians and patrons included typing errors, typing in the wrong window, ambiguous terminology, differences in expertise between patrons and librarians (Koshik, 2012). Looking at Librarians competencies may shade light into how the above limitations can be ameliorated.

Disadvantages

Like any new venture or project challenges are always experienced. According to the accounts of Marsteller and Neuhaus (2001) and Katz (2013), some of the disadvantages of chat service include staffing challenges in that
appropriate personnel recruitment need to be done prior to engaging in the service to ensure that there are sufficient employees to run the service. Implementing chat services without hiring additional personnel places greater demands on the librarians. This in turn affects librarians’ schedules which become less flexible. Matters may be even more complicated when Librarians lack the necessary subject knowledge. Librarians have also indicated that lack of visual and verbal cues (Janes in Ghasri & Dehghani 2009) impact on their speed of understanding and interpreting patron needs. During reference interviews Librarians depend on patron cues to elaborate the situation. In case of Chat Reference, the librarian receives no visual or auditory cues during the reference interview. In addition typing takes time, and not all librarians can type fast, when it takes longer and there is no information to alert the patron what is going on, users log off before librarian finishes answering a query.

**Competencies of a Chat Reference Librarian**

There are several competencies that are critical for a successful Reference Librarian both during face to face and in virtual environments. Coffman (2003, p. 53) discusses 5 qualities including: Enthusiasm; where by the operator is expected to express enthusiasm in order for the requesters to feel that they will get the assistance they need. Coffman (20023) argues that a person’s enthusiasm for virtual reference is one of the most critical factors in determining how successful the service will be. Staff excited about what they are doing will have the motivation to learn what they do not know, and be able to deal more effectively with the inevitable frustrations and challenges of the job. Fast action which he refers to as “Quick on their feet” in that the staff providing reference services needs to be a fast thinker, quick in action (responding to queries) and knowledgeable about the collection, sources and services from which they will get the responses fast. Selecting librarians who are good at retrieving quick answer questions are likely to be good and do well with virtual reference. Good customer service skills: Chat Reference librarians need to show users that they are approachable and interested in helping them, this means that they have to have good customer service skills, be willing and prepared to learn new techniques that may be necessary in chat such as keeping in contact with users and not leave them waiting for long.

Comfortable with technology: Virtual reference involves working closely with the computer and using a variety of software applications that might crash or just doesn’t work, the more comfortable staff using the computer and the software applications the better they will be at dealing with inevitable technical issues when they occur. Knowledge of electronic resources: Most chat reference questions are answered using online resources, and virtual reference patrons look for electronic resources that is available right away and can be accessed from home or anywhere, that is why virtual reference librarians should be familiar with the electronic resources available as they are familiar with their print collection. Electronic as well as print resources change all the time, and software used can get complicated, so it would be better to arrange for regular training and refresher courses in this area.

**Evaluation of Chat Reference Service**

It is necessary to evaluate chat Reference services in order to establish if the service is successful and how best to improve the service. Several studies have been conducted. There are techniques used to evaluate the effectiveness of chat reference that have been compiled by Ronan and Turner (2002 in Katz 2013). Their suggestion indicate that assessment of Chat Reference Services can be accomplished by:

- Tracking the number of transactions.
- Asking the users to fill out online surveys
- Conducting focused groups interviews/discussions and or
- Interviewing users periodically.

While not all librarians are convinced that digital reference service is reliable, some think that having a telephone conversation is much easier, and others perceive online services as a technological development that is not reliable and may cause problems for the library. Digital reference service fails or succeeds on level of quality, or whether or not users receive the type of response they expected. According to Katz (2013, p.7), a group of consortium of experts pointed out that any working service especially Virtual Reference Service must include the following:

- **Accessibility:** available on the web to access in a foreign language.
- **Prompt turn-around:** the goal is 100% answers within one or two business days.
- **Clear policies:** from question-answering procedures to types of answers provided.
- **Interactive:** offer real time interviews and responses.
- **Instructive:** not only offering clues to what the user may obtain online to answering a question, but provision of subject experts to provide answers or guide to where and how they will get the information they need.
- **Authority:** have subject experts who only answer questions, but tell the user how to find answers online.
- **Privacy:** all communications between users and the library are treated as confidential and protected from being accessed by the public.
- **Review and evaluation:** a periodical process to check satisfaction of both users and staff.
• Provide related information: show basic resources on the web as well as lists of links.
• Publicize and market the services to let the community you are serving become aware of the service and what they can gain from it.

6. EXPERIENCES FROM ACADEMIC LIBRARIES

Below experience from three academic libraries is discussed.

Purdue University Libraries

Purdue University libraries have been providing Chat Reference Services for a number of years since 2003. Started with “Ask a Librarian” as an email service and developed to full Virtual Reference services. Currently they have expanded a feature of their “Ask a Librarian”, making it more robust and exploiter-friendly for those seeking quick on library service. Regular users are now able to informally converse with library staff directly from the Library home page. The interface appears in the lower left field. Since 2003, library staff typically answer between 250 and 350 reference instances per month. Patrons also can also submit questions to Ask a Librarian via e-mail service, which generally takes one to two days for a question to get answered. Reference queries are also handled for patrons visiting the Reference/Service Desk in-person, and by phone. A self-service section includes Frequently Asked Questions, quick reference, research guides, tutorial and technical support. In addition to Purdue Libraries’ home page, Ask a Librarian is available on each individual library i.e. for all campus and branch libraries’ home pages. When the chat service is closed, questions are routed to e-mail and are handled in the next work day.

University of Nevada

Librarians from the University of Nevada encounter many questions that are not related to library services. Because of that, the first question that librarians ask when they start the chat is about finding out the profile of the requester, i.e. if the person at the other end of the line is a student or not. At first, students do not quite understand the chat service. That is possibly because most visitors find it strange to be chatting with a librarian as they have encountered the service through the university’s home page, where librarians are identified as “representatives of the university”. Librarians at the University of Nevada assist prospective students to find information about admissions, campus services, to complete the admission process, and to find databases for appropriate information for individual research projects and assignments. Librarians, scheduled to manage chat services are kept busy by students who ask many questions, these in turn allow librarians to polish their chat skills and knowledge about the university, services, policies and procedures in their role of campus information ombudsmen. University of Nevada virtual reference services widget/icon features prominently on most of their library’s Web pages through “Ask a Librarian” links, however about 80 percent of the traffic comes through a “Chat with us” link on the university’s entry page.

Zayed University Library and Learning Commons

Zayed University (ZU) library uses the SpringShare online chat reference as one of its distinct and cutting edge service practices adopted in academic libraries in United Arab Emirates (UAE). It is available during the library operating hours; public services librarians at the Reference and service desks scheduled for one to two hours assist patrons through face to face, email and manage the Chat Reference Service. The service at Zayed University is synchronous. A patron logs a question and the library staff responds immediately. Some questions are directional or those needing short direct responses, while others are in-depth research questions involving a reference interview for the library operator to understand better the patron’s information need and either guide the requestor to the resource or walk them through a search and allow them to find and select the resources they need. Patrons are polite and conclude the communication by thanking the operator. It is a new service and was opened through a soft launch. Promotion and marketing is done by Instructional Reference Librarians in classroom during information literacy instruction. Plans are underway to organize a university-wide marketing by the Library Marketing and Publicity Team, responsible for promoting library resources and services.

ZU has two campuses in Abu Dhabi, and Dubai, the two large cities in the UAE; this Chat Reference Service is an example that the service enables students, faculty and staff to connect with librarians regardless of where they are geographically located. Chat is accessible through a home or work computer, whether the users are off or on campus. This provides them with options to approach reference service either online via email, chat or by telephone. It is also possible for the patrons to use the available frequently asked questions (FAQs), especially when the library serves a massive population of students. In addition to ZU community, members of the UAE Community or any person from around the world visiting the Library Website may use the ZU chat reference service. As per RUSA guideline, the Chat service widget is placed on the library homepage where it is visible for the patron to easily identify/notice and take advantage of the service. The service is a recent development, last 3 years. It was introduced as a trial and has not been evaluated yet. Given the nature of the introduction, the researchers believe that marketing the services and promoting chat service through various methods and media, campus announcements and a proper organized campaign as done at University of Texas at San Antonio with the “Blue Crew” (Kemp et al 2015) would have resulted in more usage especially among graduate students.
For chat services to be successful, practitioners believe that the best practice calls for better knowledge and training of the operators.

7. RECOMMENDATIONS FOR BEST PRACTICE

In order for any project to be successful, advice about how best to achieve success is usually needed. For Chat/Virtual Reference Services we have learnt that:

- A dynamic Chat Reference should be accessible via different technological devices and be visible on the library web page, in addition targeting other key webpages on the library website that assist patrons at different levels of their research process is beneficial in both assisting the patron and increasing the number of people benefitting from the service.
- In cases of bilingual environment, the chat/virtual reference service should support library patrons/visitors in their language of choice.
- Promotion/marketing/publicizing of the service for library users is vital; it is important to inform library patrons about the service and how they can get assistance and guidance when they are not in the library i.e. reaching library staff online.
- Privacy is essential; users/patrons communication has to be protected. Thus all communications between users and the library are held in complete privacy and may not be shared. Libraries should also seek permission to display publicly through Q&A the questions and answers that are provided.
- It is also important for Libraries to conduct periodic assessments of the services in order to check the level of satisfaction for both users and staff about the service, as this does not only give them feedback on the service provided but also gaps that need to be filled and ways of improving the services, be it by staffing, improving software and visibility or introducing support services and or tools.
- Reference staffs are advised to prepare guides and related information showing basic resources on the web as well as lists of links and answers to common especially directional questions that may be used quickly or sent to patrons via the chat reference. Such support documents may save time as librarians may use them to train the users on using the materials to get their information needed.
- Library leaders may consider using free chat operation software as it is not heavily used in academic libraries; for libraries with limited funds, and from developing countries Free Chat software is practical and will serve the purpose.
- Consistency in addressing and responding to user questions is important, to do this, Chat Reference Librarians in the same institution should work together to set guidelines on structured ways/procedure for responding to questions from users. Many libraries prepare scripts and use them to train chat service operators so that they know how to start, proceed and end the communication.
- Clear policies are needed to guide operators/librarians in the whole process i.e. from question-answering procedures to types of answers provided.
- Chat Reference transactions are interactive, librarians are advised to offer real time reference interviews and response. If and when busy searching for a response keep communicating with the patron/user to assure them that you are searching for information to assist them to ensure that they do not despair and leave the interaction halfway. And finally,
- Librarians and other staff managing Chat services should know that the information they give out to patrons should be instructive and make use of teachable moments that occur just like it is done during face to face at the reference desk. If the question is too discipline oriented or seeks expert knowledge of the subject, refer the patron to the subject specialist.

8. CONCLUSION

Although Chat Reference Services have been around for more than two decades, academic libraries in the United Arab Emirates have not all implemented the service. A search on the academic libraries Websites revealed only 6 academic libraries provide virtual real time services, while others still provide email and telephone. Given the needs of the 21st century academic library patrons, changing curriculum and modes of instruction, it is important for academic libraries to engage in better ways of providing services to their patrons, while taking advantage of technology. Libraries implementing Virtual Reference Services now will find it manageable since the technology is better and there are many resources to guide them in the process of decision making and implementation. In addition free software is also available.

REFERENCES


INNOVATION MANAGEMENT FOR SMALL AND MEDIUM-SIZED LIBRARIES – A COMPARISON WITH START-UPS AND SMALL- AND MEDIUM-SIZED ENTERPRISES

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ABSTRACT

In spring 2015 an online survey among German-speaking librarians and information specialists was carried out to identify the critical success factors in innovation management in libraries and information centers. About 490 persons responded to this survey. Furthermore circa 20 executives / directors of libraries were interviewed to get a concrete view and assessment of special framework conditions relating only the management level.

The results and analysis of the survey will give answers about the critical success factors in innovation management in libraries. In addition a comparison between the opinion and assessments of the employees and executives will be possible. The survey is done in spring 2015. It is the long-term objective to strengthen small and medium-sized libraries and information centers in their efforts to introduce or to optimize their own innovation management.

INTRODUCTION

Systematic innovation management is a key business strategy nowadays. The large speed at which technological and social changes are taking place worldwide creates challenges for innovation management in enterprises. Big manufacturing companies are the leaders in this field, because at the end of the innovation process applications can be made for patents that ideally represent new products or optimize existing ones. Systematic innovation management is however less developed in small and medium-sized enterprises and service providers, e.g. libraries and information companies. Information science institutions only seldom follow a strategy, so that innovations are often a result of chance. But more demanding customers are looking for innovative services and products. So, also libraries are increasingly facing competition outside the sector.

In Germany, new impulses are traditionally coming from SME with 75% of all innovations developed by small and medium-sized enterprises, they are the backbone of German’s economy. In a micro enterprise the headcount¹ is less 10, in a small enterprise he headcount is less 50, and in a medium-sized enterprise the headcount is less 250 (European Commission, 2003). Nearly all libraries belong to this category. Therefore it seems reasonable to compare the innovation management of SME and libraries / information centers and to identify the critical success factors of innovation management. Annual turnover and annual balance sheet are not taken into consideration for libraries.

Comparison SME – Libraries / Information Centers

In 2013 / 2014 a theoretical study war carried out about the possibility of the comparability of small and medium-sized libraries and small and medium-sized enterprises (SME) (Georgy, 2014). It was the goal to determine the similarities of both types of institutions in the field of innovation management. Most SMEs normally only have a few number of qualified personnel and do not have own departments of innovation management. They are characterized by

- Restraint about the use of new media,
- Resistance to innovation,
- Individual „ad-hoc“ decision culture / making decisions instinctively and intuitively,
- Lacking the essential business management skills and knowledge,
- Dominating of the day-to-day business,
- Team culture focused on status quo,
- Innovation methodology is poorly developed and rarely used (Georgy, 2014, p. 5).

¹ Headcount: Annual Work Unit (AWU)
But many of employees are responsible for barriers of innovations too. Main reasons are:

- Lack of understanding that everyone is responsible,
- Fear of criticism,
- Lack of time,
- Team culture too focused on status quo,
- Fear of failure, and
- Lack of motivation (Management Innovation eXchange, n.d.).

The result: libraries / information centers are facing similar problems in terms of their resources and competencies.

SMEs and Success Factors in Innovation

Basis of identifying critical success factors in innovation management in libraries and information departments was an empirical study of Fraunhofer Institutes IAO (Institut fuer Arbeitswirtschaft und Organisation) and ISI (Institut fuer System- und Innovationsforschung): Critical Success Factors Enhancing the Innovation Capability – an Empirical study with manufacturing SMEs (Kirner et al., 2007). It was the goal of this study to “outline existing practices and models to evaluate a company’s innovation capability”, to present an “innovation model, which provides a conceptual backbone to evaluate a company’s innovation management performance” and to introduce a “three-stage to improving the innovation capabilities of SMEs” (Bullinger et al., 2007, p. 18).

In this study 2006 executives were questioned by telephone on the basis of a catalogue divided in 28 success factors. (Kirner et al., 2007, p. 51). The factors are classified to the organisational fields:

- Innovation strategy,
- Technology,
- Competencies and knowledge
- Products and services,
- Innovation processes,
- Structure and networks,
- Market,
- Innovation culture,
- Project management, and
- Methods and tools.

A selection was made of the large numbers of critical success factors. Main criterion was the transferability to service institutions. Because the key-factor of conception the online-questionnaire was the evaluation of critical success factors, on the one hand the relevance of these factors and on the other hand the presence in the own institution were questioned in a double scale.

The Questionnaire

The online-questionnaire was activated from 5th to 31th May 2015 and was addressed to everybody employed in libraries or information departments. 736 persons opened the online-questionnaire, 487 persons replied to the questionnaire. So the dropout rate was 33.83% (487/736 = 0,6617, 1 - 0,6617 = 0,3383).

Socio-demographic data

- 91% of the respondents are employed in a library, 9% in an information department.
- Of those persons, employed in a library, 40% are working in an university library, 37% in a public library, 17% in a scientific special library and 6% in another type of library.
- 76.3% of the respondents are female, 18.7% male, and 5.1% gave no information on this.
- Nearly 60% of the respondents have a subject-specific Bachelor’s or Diploma degree e.g. in library science, nearly 20% have a Master’s or University diploma degree, the others are students or have a vocational degree etc.
- 57% of the respondents take a leadership role within the library or information department.
- Of these 48% head up a library or information centers, 21% head up a department, 20% head up a team or a branch library.

The survey results with a wide spread of the socio-demographic data were a good basis for meaningful data in the further section of the questionnaire. It is worth noting that 10% of the respondents answer “nobody” and only 1% employs an innovation manager. As can be seen from Figure 2 the number of persons actively involved in innovation management is small. So, the answers are congruent with the answers of question one.
In the following, only a few selected results of the critical success factors can be presented. The results are shown as a double scale: on one the relevance, on the other the presence in the own institution. The ordinate shows the answer options:

- Four: completely agree / very important
- Three: rather agree / quite important
- Two: less agree / less important
- One: not agree / not important.

As a result, more than 350 respondents feel it is important that the management indicates the willingness to try something new, but less of the half feel that this is fulfilled.

There remains a huge gap between relevance and presence. This critical success factor seems to be very important, the reality, however, is different. The answer is a further indicator that innovation management in libraries and information departments are rarely the object of a systematic strategy integrating including the entire staff.
Fig. 5: Employees, promoting and accelerating innovations are distributed in all levels in the hierarchy
A distribution to all levels of hierarchy is assessed as very important but the scale “presence” shows a wide variety of the responses.

Fig. 6: Above-average engagement and personal initiative
An above-average engagement and personal initiative were considered as fully relevant but the difference between “relevance” and “presence” is significant. The half of the respondents is of the opinion that this success factor is not fulfilled.

Fig. 7: Professional qualifications of the employees relevant for innovation management are developed
Obviously, a clear majority feels that their qualifications relevant for innovation management are insufficiently. This answer makes one sit up and take notice because knowledge on innovation management, technology trends etc. are the basic requirements for a successful and systematic strategic innovation management. Also, many librarians / information specialists are of the opinion that the professional and social qualifications / skills necessary for successful innovation management are not promoted enough.

“There are numerous effective continuing vocational training opportunities for engineers in innovation management, especially in the area of product innovations, but most of these training opportunities are not appropriate for service institutions like libraries. Participants in these courses and degree programmes learn a
good deal about research and development (R&D), intellectual property (IP), presentation of technical details and prototyping. ” (Georgy, 2015)

It’s the problem, there are only a few programs offerings in innovation management for service and process innovations. One example is the Executive Master’s Degree in International Media Innovation Management at Berlin University for Professional Studies. (Deutsche Universitaet fuer Weiterbildung n.d.)

“[…] a master’s level study programme could be too time-consuming, extensive, and detailed. On the other hand librarians and information specialists cannot build up their expertise by self-learning due to the complexity and large number of the issues involved in innovation management. A part-time certificate course therefore seems to be more appropriate to educate and qualify librarians as innovation managers.” (Georgy, 2015 Aug 13)

The German Rector’s Conference (HRK) demands other further education formats:

“More comprehensive and more in-depth than further training courses that e.g. are in the form of a seminar or workshop lasting a day or two […] such courses [certificate courses] are meant to enable those who pass them to apply and to develop new action strategies and solution approaches to real challenges / problems in their everyday work, i.e. the teaching concepts are oriented to the “learning outcome” required.” (HRK 2012, p. 17)

Therefore, one solution could be the development of a certificate course in innovation management for librarians and information specialists that includes a high proportion of e-learning and practice. This course could qualify librarians and information specialists to master the challenges posed by innovation management better. Such a course should have a strong practical orientation and must be structured along all lines and stages of an innovation process, so that participants could apply theory directly to practice. (Georgy, 2015 Aug 13) Also the result of the question “Are innovative ideas assessed based on predefined criteria in a systematic way” shows that libraries and information center very rarely use systematic innovation management: nearly 75% of the respondents answered that predefined criteria are not or seldomly used in a systematic way. Also, innovation goals are not clearly defined and communicated.

Figure 8: Failures are tolerated and seen as lessons learned

A climate of innovation culture where failures are tolerated and seen as a chance seems to be relevant, but only a few institutions foster this open culture. Chesbrough 2003 defines open innovation as “[…] a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open Innovation combines internal and external ideas into architectures and systems whose requirements are defined by a business model,” (Chesbrough, 2003, p. XXIV) 2006 he specifies: “Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. […]” (Chesbrough, 2006, p. VII) These external entities can be: customers, experts, partner organizations (libraries), sources outside the own branch, suppliers, universities etc. Knowledge and innovations (ideas) often depend on the human resource capacity which is often quite limited in public libraries. Leifer et al. formulate it as follows:

“You need a great team of people with diverse skills to perform a symphony well, but no team has ever written a great symphony! While cross-functional teams are key players in defining and implementing incremental innovation projects, cross-functional disruptive individuals tend to be key players in defining radical innovation projects”. (Leifer 2000)
Customers are integrated into the innovation process

There are a lot of advantages for sharing knowledge by open innovation:

- Using the experience and knowledge of customers
- Increase market acceptance of new products / services
- Improve the image
- More personalized services
- Early awareness of new (market) trends
- Increased consumption of the entire range of services
- Increased customer loyalty
- Reduction of development costs
- Reduction of acquisition costs (Georgy, 2012, p. 8)

Therefore, libraries and information center should try to integrate open innovation in the own strategy to support the own knowledge management by external ideas and knowledge.

The findings are only a small part of the whole questionnaire, but it becomes clear that there are a lot of gaps between importance and presence of important aspects in innovation management.

Critical Success Factors – A Comparison between SMEs and Libraries / Information Centers

Below the most important, the least important, the existing and non-existing critical success factors in SMEs and libraries / information centers are listed.

Existing Critical Success Factors

Table 1: Most important critical success factors with regard to their relevance

<table>
<thead>
<tr>
<th>No.</th>
<th>SMEs</th>
<th>No.</th>
<th>Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Willingness of management trying something new</td>
<td>1.</td>
<td>Willingness of management trying something new</td>
</tr>
<tr>
<td>2.</td>
<td>Contributing of ideas and proposals of employees</td>
<td>2./3.</td>
<td>Contributing of ideas and proposals of employees</td>
</tr>
<tr>
<td>3.</td>
<td>Above-average engagement and personal initiative</td>
<td>2./3.</td>
<td>Social competencies of employees</td>
</tr>
<tr>
<td>4.</td>
<td>Very good knowledge about competitors</td>
<td>4./5.</td>
<td>Professional competencies are developed systematically</td>
</tr>
<tr>
<td>5.</td>
<td>Fast and short decision making paths</td>
<td>4./5.</td>
<td>Regular exchange with other libraries and universities etc.</td>
</tr>
</tbody>
</table>
The table shows conformity of the two top critical success factors. Unlike libraries, private companies are essentially under constant competitive pressure. So knowledge about competitors is more relevant and speed is a major success factor: promptly converting new ideas into marketable products and satisfying customer needs.

Table 2: Most important critical success factors with regard to their presence

<table>
<thead>
<tr>
<th>No.</th>
<th>SMEs</th>
<th>No.</th>
<th>Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Willingness of management trying something new</td>
<td>1.</td>
<td>Willingness of management trying something new</td>
</tr>
<tr>
<td>2.</td>
<td>Contributing of ideas and proposals of employees</td>
<td>2.</td>
<td>Acquisition of new customers with new products and services</td>
</tr>
<tr>
<td>3.</td>
<td>Innovations are part of the company’s strategy</td>
<td>3.</td>
<td>Contributing of ideas and proposals of employees</td>
</tr>
<tr>
<td>4.</td>
<td>Fast and short decision making paths</td>
<td>4./5.</td>
<td>Professional competencies are developed systematically</td>
</tr>
<tr>
<td>5.</td>
<td>Open and transparent handling with information</td>
<td>4./5.</td>
<td>Knowledge about innovations in other libraries, information departments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5./6.</td>
<td>Regular exchange with other libraries and universities etc.</td>
</tr>
</tbody>
</table>

The question “Innovations are part of the company’s strategy” was not part of the questionnaire for librarians and information specialists. On the other side the aspects “Acquisition of new customers with new products and services”, Professional competencies are developed systematically”, and „Knowledge about innovations in other libraries, information departments “ were not part of the questionnaire to SMEs.

But again the aspects “Willingness of management trying something new” and “Contributing of ideas and proposals of employees” are the most often implemented factors.

Table 3: Most unimportant critical success factors with regard to their relevance

<table>
<thead>
<tr>
<th>No.</th>
<th>SMEs</th>
<th>No.</th>
<th>Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1./2.</td>
<td>Future-oriented technologies</td>
<td>1.</td>
<td>Scheduled completion of innovation projects</td>
</tr>
<tr>
<td>1./2.</td>
<td>Incentive systems for ideas of employees</td>
<td>2.</td>
<td>Integration of customers in innovation projects</td>
</tr>
<tr>
<td>3.</td>
<td>Scheduled completion of innovation projects</td>
<td>3.</td>
<td>Employees are making independent decisions</td>
</tr>
<tr>
<td>4.</td>
<td>Individual performance evaluation of employees</td>
<td>4.</td>
<td>Individual working conditions their and flexible shaping</td>
</tr>
<tr>
<td>5./6./7.</td>
<td>Contacts to other organisations</td>
<td>5./6.</td>
<td>Social qualifications / skills necessary for successful innovation management are promoted systematically</td>
</tr>
<tr>
<td>5./6./7.</td>
<td>Individual working conditions their and flexible shaping</td>
<td>5./6.</td>
<td>Early awareness of new (market) trends</td>
</tr>
</tbody>
</table>

There is only a little correspondence between SMEs and libraries. The correspondences are on the both items “Scheduled completion of innovation projects” and “Individual working conditions their and flexible shaping”.

It is the goal to develop an innovation audit, a kind of innovation card and further educations and tools for libraries and information center like Fraunhofer did (Bullinger et al., 2007, p.18). Otherwise there is the risk that libraries and information centers quickly lose touch with latest techniques, methods and services.
Table 4: Most unimportant critical success factors with regard to their presence

<table>
<thead>
<tr>
<th>No.</th>
<th>SMEs</th>
<th>No.</th>
<th>Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Scheduled completion of innovation</td>
<td>1.</td>
<td>Integration of customers in innovation projects</td>
</tr>
<tr>
<td>2.</td>
<td>Selection criteria for innovation projects</td>
<td>2.</td>
<td>Many employees foster innovations</td>
</tr>
<tr>
<td>3.</td>
<td>Incentive systems for ideas of employees</td>
<td>3./4.</td>
<td>Professional competencies are present</td>
</tr>
<tr>
<td>4.</td>
<td>Setting for clear fields of innovation</td>
<td>3./4.</td>
<td>Social qualifications / skills necessary for successful innovation management are promoted systematically</td>
</tr>
<tr>
<td>5.</td>
<td>Financial and technical risk management</td>
<td>5./6.</td>
<td>Selection criteria for innovation projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5./6.</td>
<td>Autonomous decisions of employees</td>
</tr>
</tbody>
</table>

REFERENCES


CHALLENGES OF MODERN FISCAL MANAGEMENT AND LEGACY OF THE PAST : INDIAN EXPERIENCE

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ABSTRACT

New Zealand surprised many stalwarts of fiscal championship when it proclaimed fiscal management through strong budgetary (revenue) reforms. Subsequently following by United Kingdom remained still quite unheard in many developing countries.

Beginning from the latter half of the 20th century the Central Bankers across the globe started getting stressed with management and repair of the capital base of commercial banks which faced the challenges of interest rate risk and credit risk. However, the third world nations realised that excessive dependence on the Central Banks would be a sure recipe for financial and fiscal disaster if the banking systems didn’t improve.

Financial sector reforms aimed at providing better financial markets for governments as well as for corporates in terms of cost-effective borrowings. In India the well-meaning reforms for financial sector, together with the findings of Khan Committee, Sukhmoy Chakraborty Committee, Narsimham Committee I & II and Tarapore Committee, the corridor of fiscal soundness was nearly paved. Sound fiscal management for steady, faster and sustainable economic development became inevitable with the faster blowing winds of financial volatility and trade reforms agenda already in place across the globe.

Indian fiscal architecture was to be seen in terms of fiscal federalism that surrounded the letter and spirit of fiscal ethos. The challenges of the twelfth, thirteenth and fourteenth Finance Commissions were far too elaborate and quite unprecedented than ever before with earlier Finance Commission. The Gadgil formula was revisited. Now, clarion was too clear with the promulgation of Fiscal responsibility and Budget Management Act of 2003 and subsequent rules (Kelkar Committee) in 2004. Fiscal facilitation and fiscal consolidation under Debt Consolidation and Relief Facility (DCRF) of the Government of India promised those states that have enacted their own FRBM Acts with better prospects and endowed capacities to meet future challenges of expanding and qualitative expenditure. The treatment to be accorded to various budgetary deficits including Revenue Deficit, Primary Deficit, Effective Revenue Deficit and Fiscal Deficit was a fresh challenge. Given the legacy of the past in terms of government pensions, lucrative interests of small and provident funds savings, together with exuberant subsidies it has been very challenging for Indian fiscal management champions. Longer path has been treaded still longer is to be treaded yet.

Keywords: Financial Markets, FRBM Act 2003, DCRF, Finance Commission, Budgetary Deficits

1. INTRODUCTION

Fiscal management entails the subject matter of financing and investment of resources at the end of the governments functioning at the national and sub national levels. Hence, the purview of fiscal management is bigger than any other domain of economics in a macro perspective. Researches, on the facets of fiscal management, have developed necessary insights for macro level planning and budgeting. The understanding of Fiscal management is a complete appreciation of government (public) financial management. Fiscal management deals with three broad aspects ‘Fisc’ or the public exchequer viz. the revenue (R), the expenditure (E), and the gap between the (R) and (E). And this gap can be filled up either with generated/created resources, or with the borrowed resources, hence the third pillars of fiscal management is the debt (and other liabilities of the government). The borrowed resources together with the resources generated by the governments (from tax & non-tax revenues accruing to the government) are finally the receipts of the government, and the expenditure by the government includes the plan (revenue & capital) and non-plan (revenue & capital) expenditure of the government. This way, the study of government finance, ultimately, captures the essence of budgeting in the government. The two sides of the budget are the ‘receipts budget’ and the ‘expenditure budget’. The receipts budget includes the revenue (tax and non-tax) to the government, and the expenditure budget includes the plan (capital and revenue) and non-plan (capital and revenue) expenditure.
In developing countries and also transition economics it is seen that there exists a substantive gap between revenues and expenditure. It is interesting to note though the revenues in the government keep on increasing (in absolute terms) yet the pace of increase in expenditure, on account of changing developmental profile of the economy, oversteps the swollen magnitudes of revenues. Thus revenues always fall short of expenditure, calling for additional (borrowed) resources. It can thus be seen that the study of fiscal management is the study of coordination function of the government-coordination between expenditure and revenues and coordination between revenues and debt.

The subject matter of modern fiscal management relates additionally with four fiscal function viz. allocation function, distribution function stabilization function and coordination function. Allocation function refers the resources’ allocation (outlays), distribution function mentions distribution of developmental gains and sacrifices (equitable taxation burden) within the economy, stabilization function is about stability of the economy in terms of prices within real sector and interest rates in the financial sector, besides foreign exchange conversion rates. The coordination function is all about budgeting.

What has very recently captured the attention of the researchers and analysts is their increased attention towards an extremely important economic phenomenon, which is the trend, size and dynamics of Current Account Deficit (CAD) in the balance of payments (BoP). CAD is one measure of how much resources gap a country has in managing its external sector. CAD also indicates a balancing surplus in the other account of BoP viz. capital account. However, the corresponding (to current account) capital account surplus in the BoP doesn’t leave a very healthy impression as this surplus in the capital account is mostly for reasons of capital receipts of the liability nature, which in the course of time only adds to the current account deficits. Therefore, by capturing the essence of external sector movements of prices and / or the forex rates / forex reserves a more realistic assessment of fiscal stress of bounty can be made available.

Further to the interest of public financial economists are the relevant aggregates of ‘national income’ and the ‘money supply’ (MS). The very essence of modern fiscal managements doesn’t surface in its enormity in the absence of an appropriate appreciation of ‘national income accounts’ (NIA), BoP accounts and MS in the economic system. Such concepts and movements their related aggregate are the foundations of budgeting. A budget cannot be prepared realistically unless due appraisal of the national income, balance of payments and potential expansion of money supply (monetary) aggregates are available. For specific outlays all sectors finally depend upon the budgetary provisions.

Among other macro aggregates that interest a public financial economist include inflation and employment. The magnitude of inflation does assist a planner to use discretely the specific deflators. It further helps a proper assessment of financial and real sizes of income, interest rates etc. the data on employment or unemployment revolver’s the need for expansion of avenues for employing various factors inputs (land, labour, capital etc.). In case provisions are created in the budget, it certainly calls for additional resources and opens up space for deficits. Various schemes and projects of the government, once finding outlays in the budget, invariably blow up the public expenditure.

The chart, given below, characterizes the fact that budgeting decisions heavily depend upon the national income accounts, the balance of payments accounts and existing state & money supply.

**Chart 1 Depicting the Inter-dependence of Domestic and External Sectors**

Release of relevant statistics (in India) is done by (i) Ministry of Statistics and Program Implementation (MoSPI) of the Union Government of India, and (ii) Reserve Bank of India (RBI). The MoSPI is aided in terms of data by a number of ‘departments’ and ‘organisations’. The important ones include, Neeti Ayog1, Department of Economic Affairs2, Director General of Foreign Trade3 (DGFT), Controller of Aid Accounts & Audit4 (CAAA), to mention some.

It has been experienced, in general almost by all economies, that a larger chunk of resources gets directed towards managing the social, or the priority sectors. This also impacts banking and forthcoming money supply, and ultimately the financial markets5. With the introduction of each new scheme and programs by the government the first signs of movements are seen in the government securities in the money and capital markets. The borrowings and other liabilities created by the government would leave fewer resources for the remaining sectors of the economy. Here, it makes sense to state that borrowings (capital receipts) in the government beyond a point render scarcity of

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1 Erstwhile Planning Commission of the Union Government of India.
2 A Department under the Ministry of Finance, Headed by a Secretary to the Government of India level officer.
3 A Directorate under the Ministry of Commerce of the Union Government of India.
4 A setup under the Department of Economic Affairs, Ministry of Finance, Union Government of India.
5 Indian financial markets follow a four-fold classificatory scheme viz. money market, capital market, government security market and foreign exchange market.
resources in the financial markets, finally resulting into prices (rate of interest) upsurge in the financial markets. Such liabilities, if not managed carefully, lead to specific issues of sustainability of public debt. The unsecured stock of liabilities of the government, in larger possibility, is to impact either the vertical, or the horizontal, or both the equities in taxation. In small, expansion of social sector, nurtured exclusively by the government, may lead to either unsustainable debt or the escalations in tax rate (vertical) / widening of tax base (horizontal). Such a situation, if exits, is bound to leave detriments on future budgets of the government.

The challenges of modern fiscal management eventually confine to the challenges emanating from (a) administration of the ‘fisc’; and (b) management of the ‘fisc’. Hence, public financial administration and public financial management are the core challenges of economic management of a nation. Government finances, in terms of their composition and direction depend on specific macroeconomic policies, especially the fiscal policy, the monetary policy and the commercial (trade) policy.

The administration of exchequer is an important functional domain in the government. In India the composition of exchequer is shaped up in the form of three specific accounts.

The administration of financial resources follow definite sets of rules and or legislation. In every country such prescribed rules are in existence. In majority of countries the legislation also has been exacted. The management of financial resources require altogether different sets of skills besides a broader template with acceptability and requisite governmental mandate. In India the ‘General Financial Rule (GFR) 2005’ and ‘Fiscal Responsibility and Budget Management Act (FRBMA) 2003’ provide the basis for administration and management of financial resources. The Indian States, except J&K and Sikkim, have enacted their respective state FRBM Acts by 2005.

Both, management and administration of ‘Fisc’ call for a sincere adherence to the ‘core fiscal functions’. The fiscal functions are four-fold and as given below. These fiscal functions indicate a fine blend of application of equity, economy, efficiency and effectiveness as is expected to be enshrined in the intent and content of (a) fiscal policy of the government, and (b) manuals governing skilful and honest creations of budgets. Further, the fiscal functions draw attention to the massive need for reforms in the three core economic aspects of government financial management. In the case of government budgeting it is outcome orientation of the budget, in the case of government accounting it is desirable transition from cash basis of accounting to accrual accounting, and finally the costing calls for life-cycle costing of the assets and infrastructure that is created by/in the government.

The new dimensions of public financial management put sufficient emphasis on the importance of public procurement. It is seen from the Government Financial Statistics (GFS), statistics generated by the World Bank and Organization, publications of the Economic Cooperation and Development (OECD) and Country Procurement Assessment Reports (CPAR) that broadly some 15-26 percent of the GDP is spent on public procurement by different government across the globe. These days the governments at the state levels, besides the national governments have been highlighting the importance of public procurement in terms of their importance in capacity building at the national and the sub national levels. The sectoral assessment, in terms of their need for resources and

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6. Irrespective of their annual or medium term orientation of the Government Budget.
7. Government Budgeting, Government Accounting and Costing of infrastructure in the Government...
the availability thereof, has certainly benefitted from the outcome of select specific studies conducted by the researchers/economists and regional institutions.

“Sustained increase in competitiveness of an economy is a hallmark of economic strength and stability of that economy. Worldwide, there has been an increasing awareness, especially among emerging market economies (EMEs), about the need to strive for improved competitiveness to face the realities of the globalised trading environment.

In the case of India, such recognition is reflected during the recent years, particularly in the constitution of National Manufacturing Competitiveness Council” (Lakshmanan L, Chinngaillian S and Rajesh Raj). It has more pragmatically helped the development of macro policies’ framework for providing apt trajectory for economic development and growth.

The banking sector reforms and the budgeting management legislation have withstood the capacity building template created by Indian economic and fiscal managers. And, this only has helped manage in the times of turbulence.

Beginning from the latter half of the 20th the Central Bankers, across the globe, started getting stressed with management and repair of the capital base of commercial banks which faced the challenges of interest rate risk and credit risk. However, the third world nations realised that excessive dependence on their Central Banks would be a sure recipe for financial and fiscal disaster if the banking systems didn’t improve. During 1991 to 2011 India kept pacing to grow in terms of its economic, social and human development. Its banking sector cooperated and marched along. The Finance Ministry of the Union Government of India set up various committees during this period, and mandated the committees in terms of (a) analysing India's banking sector; and (b) suggesting appropriate legislation/regulations for making the banking industry (in particular) and the financial sector (in general) more economical, effective, competitive and efficient. Two such expert Committees were set up under the chairmanship of M. Narasimham. Committees submitted their recommendations in the 1990s. Financial sector reforms aimed at providing better financial markets for governments as well as for corporates in terms of cost-effective borrowings. In India the well-meaning reforms for financial sector, together with the findings of Khan Committee, Sukhmoy Chakraborty Committee, Narsimham Committee I & II and Tarapore Committee, the corridor of fiscal soundness was nearly paved. Sound fiscal management for steady, faster and sustainable economic development became inevitable with the faster blowing winds of financial volatility and trade reforms agenda already in place across the globe.

What possibly compromised the momentous growth of Indian financial markets, the spine of Indian financial system, was its lacking width and depth. Before 1990s this lack was significant. However, with the introduction of the New Economic Policy (1991) and commissioning of several committees, in particular Narsimham Committee the
situation was captured in letter and spirits in so far as public sector banks were concerned. Among important recommendations of the Committee following were quite salient:

1. Reduction in the Statutory Liquidity Ratio and Cash Reserve Ratio
2. Redefining the priority sector
3. Deregulation of the Interest Rates
4. Asset Classification
5. Transparency in the banking system

Many of the recommendations of the committee were acceded to by the government. Important implementations by the RBI included the following:

- SLR brought down from around 38.5% (1991-1992) to some 28% in five years.
- CRR brought down from 14% to 10% (by 1997).
- Towards strengthening the banking industry RBI introduced CRAR (Capital to Risk Weighted Asset ratio in 1992) for the soundness of the banking industry.
- RBI also included new prudential reforms for classification of assets and provisioning of the non-performing assets (NPAs).
- Weaker banks were recapitalized by the government through budgetary support.
- More private banks were allowed.
- More freedom was given to banks to open branches.
- The RBI’s supervision system was strengthened.
- Rapid computerization of the banks was adopted. RBI started helping the commercial banks to improve the quality of their performance.
- The government also enacted Recovery of Debts Due to Banks and Financial Institutions (RDDBFI) Act, 1993. Debt Recovery Tribunals with an Appellate Tribunal at Mumbai for quicker recovery of bad debts. In 1995, Banking Ombudsman scheme was launched with an objective to provide quicker solutions to customers’ complaints.

Under the chairmanship of Narsimham another Committee was appointed in 1998. The Committee was termed Banking Sector Committee. The mandate of the Committee included (a) review of the banking reform progress; and (b) designing a programme for further strengthening the financial system of India. The focus of the Committee included areas such as capital adequacy, bank mergers, bank legislation, etc. The Committee submitted its report in April 1998. The following were the recommendations:

1. Strengthening Banks in India
2. Narrow Banking
3. Capital Adequacy Ratio
4. Bank ownership
5. Review of banking laws

It was visualised by the Committee that a stronger banking system in the Indian context cannot be conceived without calling for the Current Account Convertibility (CAC). The problems concerning liquidity and exchange rate management could be better handled with complete convertibility of the currency, and not alone with current account convertibility. This required mergers and amalgamations of the banks – weaker ones with stronger ones. Further to above the menace of faster accumulation of the non-performing assets (NPAs) was considered to be the most severe, hence narrow banking – allowing weaker banks to invest their funds only in short term and risk free assets. Besides Government was required to revisit the capital adequacy norms to save fast depletion of the asset base of the public sector banks. This resulted in the CAR to be 9 percent. For efficiency in the banking sector it was felt important that a thorough review of the functions of boards be done and empower them to adhere to the tenets of professional corporate strategy. What came as bonus in the recommendations included reviewing and amending main laws governing Indian Banking Industry like RBI Act, Banking Regulation Act, State Bank of India Act, Bank

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16 Ibid.
18 NPAs were as high as 20 percent of their assets in certain select cases.
Nationalisation Act, etc. Besides this the Committee also recommended a series of measures which were also adopted in varying degrees in due course of time. Such measures, among others, included the following:\n
1. Computerization  
2. Technology upgradation  
3. Training of staff  
4. Depoliticizing of banks  
5. Professionalism in banking  
6. Reviewing bank recruitment

As financial markets/systems commercial banks play a crucial role, hence reforming the operations of the banks, especially public sector banks was felt to be of foremost importance. This, in the first place, included repairing the capital base of the public sector banks. The very specific reform that has taken place in the meantime was institution of the Securities and Exchange Board of India (SEBI). Prior to the setting up of SEBI, the Capital Issues (Control) Act, 1947 governed capital issues in India. The main objectives of this Act were: (i) to ensure that investment in the private corporate sector does not violate priorities and objectives laid down in the Five Year Plans or flow into unproductive sectors; (ii) to promote the expansion of private corporate sector on sound lines in general, and further the growth of particular corporate enterprises having sound capital structure; and (iii) to distribute capital issues time-wise in such a manner that there is no overcrowding in a particular period.

The reforms in the banking sector, coupled with creation of a superior body for supervising and monitoring the conduct of business of the capital markets in India was a synthesised approach towards making a sound and sustainable financial market which in turn would provide fiscal soundness by providing cost effective resources to the government in the government securities market segment. Ahead of this, the reforms in the financial sector, both money and capital markets, were in sync with the intended takeaways from financial liberalization and financial inclusion process in Indian financial sector, starting with the proclamation of the NEP. The upsurge in banking accounts, mobile and internet banking, diversifying loan portfolios of the banks, a risk-savvy approach in banking and other financial institutions, together with reformed insurance sector have proven as accomplishments of the modified policies of the government concerning modern fiscal management. Basel compliant Indian banking is good enough an indicator for Indian intent towards a modernized fiscal endeavour.

Indian fiscal architecture has been seen in terms of fiscal federalism that surrounded the letter and spirit of fiscal ethos. The challenges before the 12th, 13th and 14th Finance Commissions were far too elaborate and quite unprecedented than ever before with earlier Finance Commission. The Gadgil formula was revisited. There has been witnessed a definite relation-ship between Fiscal Policy, Monetary Policy and Trade Policy. This relationship has been responsible on one hand for the clarity of insights in policy making, and on the other hand this relationship has also augmented the degree of complexities in solving fiscal management issues in isolation.

This relationship has finally been responsible for the promulgation of Fiscal Responsibility and Budget Management Act of 2003 and subsequent rules (Kelkar Committee) in 2004. Fiscal facilitation and fiscal consolidation under Debt Consolidation and Relief Facility (DCRF) of the Government of India promised those states that have enacted their own FRBM Acts with better prospects and endowed capacities to meet future challenges of expanding and qualitative expenditure. The treatment to be accorded to various budgetary deficits including Revenue Deficit, Primary Deficit, Effective Revenue Deficit and Fiscal Deficit was a fresh challenge. Given the legacy of the past in terms of government pensions, lucrative interests of small and provident fund savings, together with exuberant subsidies it has been very challenging for Indian fiscal management champions. Longer path has been treded still longer is to be treded yet.

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20 The Securities and Exchange Board of India (SEBI) is the regulator for the securities market in India. It was established in the year 1988 and given statutory powers on 12 April 1992 through the SEBI Act, 1992.

21 Abolition of Controller of Capital Issues and emergence of SEBI.  

22 Up to 3rd Five Year Plan (1961-66) and during Plan Holiday (1966-69), allocation of Central Plan Assistance was schematic and no formula was in use. The Gadgil Formula comprising (i) Population (60%), (ii) Per Capita Income (10%), (iii) Tax Effort (10%), (iv) On-going Irrigation & Power Projects (10%), and (v) Special Problems (10%) was used during 4th Five Year Plan (1969-74) and 5th Five Year Plan (1974-78).
Specific challenges of modern fiscal management thus seem to have emerged from the following actions of the government:

2. Initiating fiscal consolidation of the State borrowings;
3. Extending fiscal facilitation of the State Governments;
4. Launching Debt Consolidation and Relief Facility (DRF) Scheme;
5. Permitting the States to borrow directly from market;
6. Honouring the intent 73rd and 74th constitution amendments;
7. Introduction of gender responsive budget;
8. Introduction of outcome budget;
9. Setting up of Expenditure Management Commission;

Summing up

In the wake of more liberalized, privatized and globalized economies that are quite accommodative and facilitating cross-border flow of capital and labour, the capacity building within the national and international spheres has been a mega challenge. The bigger challenge is to develop the national economy with a global consideration. This not only has scaled up the need for increased resources it also had put up questions on the timely and quality expenditure management. The deficit management in its total completeness viz. revenue, effective revenue, fiscal, primary and current account (of the BoP) requires unprecedented skill upgradation on a continuous and sustained basis.

The taxation reforms on the anvil of changed regimen, calling forth a smoother transition viz. moving away from value added taxation format to the goods and services taxation, has been one core challenge of the modern fiscal management, which the Indian government is yet finding inapt to implement with notified timeline.

Dealing with deficits while and meeting the challenges of achieving the milestones of human development, millennium development goals (MDGs) juxtaposed with targets of outcome budgets, medium term expenditure framework (MTEF), accrual accounting and life-cycle costing of infrastructure in an era when the government is looking up to newer avenues of Public Private Partnerships (PPPS) is indeed amazingly challenging.

With the completion of the existing five year plan, and with a full blown settling of medium term expenditure framework, possible the challenges of modern fiscal management are going only to go to increase. The ray of hope and trust in meeting the challenges comes surely from the fast changing format of governance.

What started from a small country such as New Zealand23, and was aptly adopted and adapted by the United Kingdom, has taken India good no. of years to appreciate, but finally in the year 2003 Indian fiscal prudence

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23 Reforms in the specific areas concerning budget included (i) medium-term budget frameworks; (ii) prudent economic assumptions; (iii) top-down budgeting techniques; (iv) relaxing central input controls; (v) focus on results; (vi) budget transparency; and (vii) modern financial management practices.
prevailed and the appropriate legislation found its place in Indian public financial management. The modern outlook conducting the affairs of Indian public financial/fiscal management is quite capable of facing the challenges that emerge from various volatilities indicating internal and/or external business and economic fluctuations.

REFERENCES
AN EMPIRICAL ASSESSMENT OF FINANCIAL RISK TOLERANCE AND BEHAVIOUR OF INDIVIDUAL INVESTORS IN PORTFOLIO DECISION

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Email: agkavalam@yahoo.com

ABSTRACT
Individual investors contribute substantially to Gross Domestic Saving (GDS) in India and naturally their financial behavior and attitude in portfolio decision noticeably influence the direction and pattern of resource allocation function within the economic system. One of the unhealthy trends in the saving and investment of programme by individual investors is that out of their surplus financial resources a substantial portion was mobilized government, banks and financial institutions which is a major hurdle in channelizing the savings of individual investors to productive sectors of the economy directly and limit their wealth maximization through portfolio decision. Unrealistic Risk tolerance and financial behavior of investors has been diagnosed as a prominent reason for low preference of individual investors towards common stock and similar risky securities. In this context, the pertinent question emerges on this issue is that how do and to what extent the risk tolerance and financial behavior of individual investors influence their portfolio decision. This psychometric study was conducted to examine this complex financial issue empirically. In this study the risk tolerance of individual investors was scientifically measured by employing a risk tolerance test using a behavioural approach. Arithmetical average, correlation standard deviation, regression, cluster analysis cumulative logistics analysis Z test etc. were the different descriptive and inferential statistical measures employed to analyze data. The study clearly reveals that risk tolerance and other psychographic characteristics of individual investors strongly influence their portfolio decisions and financial preference. The study also shows that there is significant difference the risk tolerance of individual investors belonging to different demographic, geographic and longitudinal categories. Portfolio decision is a cognitive process characterized by systematic biases and distortions. Individual investors in general do not react consistently when they face risk rather they exhibit systematic biases and sensitivities. This disproportionality in individual’s risk tolerance may make the capital market inefficient and limit the wealth maximization of individual through portfolio decisions. The superior brain and market intelligence alone do not guarantee generation of extra financial gain from capital market rather emotional maturity manifested in balanced risk tolerance, diligence, patience and contrary thinking positively help individual investors to have sensibility and confidence to enter capital market which make possible creation of millions of equity centric portfolio by investors that will strengthen Indian financial system and enhance prosperity and welfare of one and all.

Keywords: Risk Tolerance, Financial Behaviour, Portfolio Management

1. INTRODUCTION
The significant contribution of individual investors to Gross Domestic Savings (GDS) and their substantial investment, short-term and long-term, in the Indian Capital market is really appreciable which clearly portend their dominant role in leading Indian financial system to the trajectory of progress and prosperity in new economic world order. The generation of adequate saving by individual investors and the judicious and fair allocation of the surplus financial resources to productive sectors of the economy through financial and physical assets largely determines the direction and trend in the growth of financial system and its prospects and destiny. Similarly, the dynamism, vibrancy, sustainability and its capacity to remain in the trajectory of high growth rate to a great extent depends on sensible and appropriate portfolio decision of individual investors and their active participation in the financial market. More importantly, only when the individual investors directly allocate their savings to common stock and growth oriented securities they can ensure wealth maximization through portfolio decision. Empirical Investigations reveals that the willingness and enthusiasm of individual investors in channelizing their surplus financial resource through appropriate portfolios largely depends on their level of risk tolerance and other psychographic characteristic influencing portfolio decision. The psychological and behavioural characteristic, approach and attitude of individual investors influence their saving and investment decision which exert strong impact on resource allocation function of the financial system and their wealth maximization through financial decision. A thorough examination of saving allocation pattern of individual investors in Indian financial system indicates that the approach of individual investors in diverting their savings to shares and other risky securities is really discouraging and imbalanced since a substantial portion their saving has been mobilized by government, banks and other financial institutions through depository financial instruments. This asymmetrical trend in resources allocation is a major hurdle in channelization
of the household savings to productive sectors, individual’s wealth maximization and also obstructs the nurturing of the entrepreneurial spirit of millions of risk-takers in industry, services and agricultural sectors in the economy. Another major problem that the individual investor with inappropriately low risk tolerance may face is the huge difference in the retirement benefits from contributory pension scheme. Thus, the reluctance of individual investors to allocate a reasonable amount of their savings to risky securities poses some challenge to the sustainable growth of financial system and prosperity and well being of individual investors. The present study attempt to empirically investigate this complex issue in financial system in respect of portfolio management by individual investors to have a realistic and fair view on this issue.

Statement of the Problem

The saving and investment decision process of individual investors is influenced by diversified variables and considerations. The differences in demographic, psychographic and behaviouristic characteristics of individual investors have noticeable impact on their level of risk tolerance and financial behaviour. In a way, these factors and considerations are the determinants of their saving propensity and selection of different types of physical and financial assets in their portfolio. In this context, a pertinent question on this issue arises is, in what way these factors influence the risk tolerance and financial behavior of individual investors. Especially, how does risk tolerance exert influence in the investment programme and portfolio design of individual investors? The following are the empirical questions that are emerged during the conceptualization and operationalisation of the research problem.

1. Is risk tolerance a prominent psychographic factor influencing the portfolio decision and financial behavior of individual investors?
2. To what extent risk tolerance influence different categories of individual investors in the selection of financial/physical assets in their portfolio?
3. To what extent there is difference in the level of risk tolerance and financial behaviour of different categories of individual investors?

Objectives of the Study

1. To assess and evaluate the level of risk tolerance of different categories of individual investors in portfolio decision.
2. To measure and analyze the degree of difference in the risk tolerance of different categories of investors using cumulative logistic analysis.
3. To diagnose various clusters of individual investors in terms of degree of risk tolerance and analyze the distinctive characters ion of these clusters.
4. To examine whether the risk tolerance influence the composition and design of portfolio and in the financial preference of individual investors.

Hypotheses

1. There is no significant difference in the risk tolerance of individual investors belonging to different geographical regions.
2. There is no significant difference in the risk tolerance of individual investors belonging to different demographic categories of individual investors.
3. There is no significant difference in the risk tolerance of individual investors in different time periods/longitudinally.
4. There is no correlation between risk tolerance and demographic characteristics/financial behavior of individual investors.
5. There is no significant impact of risk tolerance on the portfolio composition and financial preference of individual investors.

2. LITERATURE REVIEW

Several outstanding research studies are conducted on risk tolerance and financial behavior of individual investors which reveal insightful findings on this research issue. Coggin et.al (2007) in their outstanding study examined the risk factors associated with portfolio selection and management and elaborately discussed the techniques and methods to face the risk factors. The meta-analysis of pricing risk factor is really a model for serious researchers in this area.

Financial risk tolerance has been measured using several techniques. The techniques can be separated into measures
based on observing risky behavior and measures using surveys to ask questions that gauge one's willingness to assume risk in given situations (Hanna, Gutter, & Fan 2001; Hanna & Lindamood, 2004). Some studies infer financial risk tolerance from behavior such as ownership of risky assets or the ratio of risky assets to total wealth (Cohn, Lewellen, Lease, & Schlarbaum 1975; Friend & Blume, 1975; Fama & Schwert, 1977; Morin & Suarez, 1983; McNish, Ramaswami, & Srivastava, 1993; Schooley & Worden 1996). However, studies based on behavior often are influenced by self-perception/ bias and do not typically consider other factors that would prevent ownership such as financial constraints, discrimination or lack of exposure to information about financial markets. The Health and Retirement Survey posed hypothetical scenarios to obtain a measure of financial risk tolerance related to the economic concept of risk aversion (Barsky .et al., 1997). Grable (2000) presented a combination of investment choices and subjective perceptions.

The above mention studies on risk tolerance and behaviour of individual investors clearly shows that there is some relationship between risk tolerance and portfolio decision. However an analysis of the findings of the studies suggest some research gaps especially scientific measurement risk tolerance and comparative analysis of difference in nature and financial behavior of different categories of investors in this area. The present study endeavors to examine this research issue with a focus on the research gaps identified.

**METHODOLOGY**

An appropriator methodology had been formulated for the study keeping in mind the qualitative and abstract variables that are associated with the research problems. The research issues and qualitative terms were suitably operationalised and an appropriate conceptual design, measurement procedures, sample design, analytical design, data display design, hypotheses testing were developed in conformity with research objective and hypotheses.

**Population / Universe:** The individual investors both male and female within the age group of 21-75 years residing in selected regions in India who have exposure to financial market constituted the population of the study. **Research Approach:** A behavioristic and psychometric approach had been adopted for collection of data to avoid respondent’s self perception in their responses and both qualitative and quantitative approaches had been followed. **Research Method:** The study mainly followed survey method of data collection. However observation method was also appropriately employed considering its effectiveness in some practical situations. **Sample Design:** A suitable sample design was adopted for the execution of the study with an empirical focus on research problem. **Sample frame/source list** had been prepared from the list of individual investors from share broking firms located in different areas. **Size of the sample** had been determined considering the nature of universe, standard of accuracy and other research considerations. The approach based on precision rate and confidence level had been employed to determine the sample size. **Simple random sampling** was the method of sampling employed for the selection of sample unit. **Questionnaire** was the method of data collection used for the collection of primary data. In the analysis design suitable descriptive and inferential statistical measures such as averages, standard deviation, correlation, regression, Z test, cumulate logistic analysis, cluster analysis etc. had been employed. **Face validity and content validity** was the validity tests employed to determine validity of measures. **Split half reliability and test-retest reliability** had been employed to determine the reliability of measures used.

**Dependent variable** employed in this study was the risk tolerance of individual investors in terms of score assigned to them as per risk tolerance test. The level of risk tolerance of individuals attributable to different components of risk measured to derive interval level data on this qualitative variable.

**Independent variables** selected for the study were demographic, financial and geographic characteristics such as education, life cycle, social classes, occupation status, regional background, time periods etc. A cumulative logistic model had been employed for the risk tolerance analysis. The model allows different independent variables to have multi dimensional effects on the risk tolerance and examine the effects of explanatory variables on the probability of individual investors to assume different levels of risk tolerance.

**Conceptual and analytical framework**

To conduct the research study with maximum empirical clarity and focus, a conceptual and analytical frame had been developed. In the frame work different variable identified to examine the research problem are presented in an integrated manner. The identification and conceptualization of different abstract concepts that are basically qualitative in nature is very useful to view the research problem sensibly and execute the study by employing appropriate methods and procedures.
Measurement and analysis of risk tolerance

To measure the risk tolerance, a risk tolerance test was conducted which was adopted from empirical study conducted by the T. Ronce Price group of mutual fund, USA with some modifications. Since direct question on risk tolerance might fail to reveal the true dimensions of risk tolerance, this behaviouristic approach was adopted. The test consisted of three sets of questions made to test how the customers are comfortable with risk on different situations of uncertainty. Respondents were asked to select one answer for each set of questions and depending on their choices, scores were assigned. Respondents could select their choices on the basis of the level of risk tolerance and those having high risk tolerance would select choices with high scores and vice versa. No hints were given in the questionnaire on allocation of scores for options for questions so that respondents might select their right choice avoiding their self-perception.

Risk-tolerance score and its significance

The Respondents would get different points on the basis of their selection of options. The higher the total point the higher would be the risk tolerance. The respondents were grouped in to different segments according to the range of score in the risk tolerance test.

3. RESULTS AND DISCUSSION

The results of the study are presented as answers to research questions given as the specific objectives of the study. In this analysis, individual investors are classified into three groups in terms of their risk tolerance. Individual investors with low risk tolerance constituted the first group that scored between 1-7 points and those with moderate risk tolerance constituted the second group who scored between 8-14 points and the third group consisted of individual investors with high-risk tolerance having scored between 15-21 points. The overall risk tolerance of the 300 respondents is analyzed by grouping them in three distinctive groups with different ranges of scores.

Table 1: Risk Tolerance of Individual Investors – Categories

<table>
<thead>
<tr>
<th>Level Risk tolerance</th>
<th>Group</th>
<th>Sample size</th>
<th>Mean score</th>
<th>Standard error</th>
<th>95% confidential interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>Risk averse (Low risk)</td>
<td>139</td>
<td>4.312</td>
<td>0.263</td>
<td>(5.101, 3.52)</td>
</tr>
<tr>
<td>8-14</td>
<td>Moderate Risk loving (High risk)</td>
<td>125</td>
<td>10.234</td>
<td>0.284</td>
<td>(11.069, 9.402)</td>
</tr>
<tr>
<td>15-21</td>
<td>Risk loving (Substantial Risk)</td>
<td>36</td>
<td>16.267</td>
<td>0.319</td>
<td>(17.224,15.310)</td>
</tr>
<tr>
<td></td>
<td>Sample size</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data
Risk tolerance analysis suggests that general attitude of individual investors towards risk is not very positive because number of investors coming under the risk loving segments is about 10 percent of the sample size and also the mean score of different categories are near to the lowest range of risk tolerance.

Similarly, the majority of individuals belong to the risk averse category, which is also a clear indication of a lack of appetite of individual investors towards risk and their risk avoiding characteristic. Multivariable analysis of this variable in combination with some demographic variable may also be useful to reveal other clues on risk appetite and financial behavior of individual investors.

Table 2: Risk Tolerance - Demographic and Behaviouristic Categories

<table>
<thead>
<tr>
<th>Age group</th>
<th>Sample Size</th>
<th>Risk tolerance (Mean score)</th>
<th>Standard error</th>
<th>95% confidential interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-35</td>
<td>63</td>
<td>14.4</td>
<td>0.419</td>
<td>(15.657, 13.143)</td>
</tr>
<tr>
<td>35-50</td>
<td>128</td>
<td>12.3</td>
<td>0.292</td>
<td>(13.176, 11.42)</td>
</tr>
<tr>
<td>50-65</td>
<td>74</td>
<td>8.4</td>
<td>0.372</td>
<td>(9.516, 11.424)</td>
</tr>
<tr>
<td>65 and above</td>
<td>35</td>
<td>6.9</td>
<td>0.524</td>
<td>(8.472, 5.328)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Investors in Different Gender Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Investors in Different Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
</tr>
<tr>
<td>Professionals</td>
</tr>
<tr>
<td>Businessmen</td>
</tr>
<tr>
<td>Retired</td>
</tr>
<tr>
<td>Self employed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Investors in Different Life Cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor empty nest</td>
</tr>
<tr>
<td>Yong married empty nest</td>
</tr>
<tr>
<td>Yong full nest</td>
</tr>
<tr>
<td>Older full nest</td>
</tr>
<tr>
<td>Older empty nest</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Investors in Different Social Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper class</td>
</tr>
<tr>
<td>Upper middle class</td>
</tr>
<tr>
<td>Lower middle class</td>
</tr>
<tr>
<td>Lower class</td>
</tr>
</tbody>
</table>

Source: Primary data

Results of the multivariable analysis in respect of risk tolerance suggest the risk appetite of various categories of individual investors. In the age group, individual investors within the age group of 20-34 are more comfortable with risk, which is clear from the higher risk tolerance score. This is because young individuals, who wish to make a possible fortune, will be ready to assume more risks in the construction portfolio. This age group generally invest more than 60 percent of savings in growth oriented securities and financial assets with high equity components and naturally they have the capacity to assume high risk. Individual belonging to higher age group do not follow an aggressive investment strategy and avoid risky investment programmes because their main financial goal is to have a regular and consistent income and adequate liquid fund. Consequently, they prefer risk free financial securities and as far as possible, they avoid any form of risk in portfolio decisions and it is clearly reflected in the low risk tolerance score of higher age group segment. Analysis of risk tolerance of individual investors in different social classes clearly shows that investors in upper class with high risk tolerance score prefer equities and other financial derivatives in investment activity. As depicted in the table the risk tolerance of individual investors in lower middle class and lower class is very low and naturally their exposure to capital market is highly inadequate which is a major constraint in enhancing participation of individual investors in capital market.
Table 4 Cumulative Logistic Analysis of Risk Tolerance – Demographic, Geographic and Longitudinal Categories

<table>
<thead>
<tr>
<th>Level of Risk Tolerance</th>
<th>Substantial Risk</th>
<th>High Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Odd Ratio</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Geographical Background: Reference Category = Central region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td>0.0182</td>
<td>0.96</td>
<td>0.0235</td>
</tr>
<tr>
<td>Northern</td>
<td>0.3258</td>
<td>1.38</td>
<td>0.0135</td>
</tr>
<tr>
<td>Western</td>
<td>0.439</td>
<td>1.53</td>
<td>0.0597</td>
</tr>
<tr>
<td>Eastern</td>
<td>0.0195</td>
<td>0.97</td>
<td>0.0213</td>
</tr>
<tr>
<td>Education: Reference category = Higher Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>0.321</td>
<td>1.37</td>
<td>0.734</td>
</tr>
<tr>
<td>Post Graduate</td>
<td>0.389</td>
<td>1.42</td>
<td>0.231</td>
</tr>
<tr>
<td>Professional</td>
<td>0.418</td>
<td>1.52</td>
<td>0.208</td>
</tr>
<tr>
<td>Life Cycles: Reference Category = Young Full Nest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor Empty Nest</td>
<td>0.458</td>
<td>1.63</td>
<td>0.205</td>
</tr>
<tr>
<td>Young married Empty Nest</td>
<td>0.278</td>
<td>1.38</td>
<td>0.0607</td>
</tr>
<tr>
<td>Older Full Nest</td>
<td>0.139</td>
<td>0.84</td>
<td>0.164</td>
</tr>
<tr>
<td>Older Empty Nest</td>
<td>0.114</td>
<td>0.87</td>
<td>0.125</td>
</tr>
<tr>
<td>Social Classes: Reference Category = Middle class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper class</td>
<td>0.123</td>
<td>1.12</td>
<td>0.0912</td>
</tr>
<tr>
<td>Upper Middle Class</td>
<td>0.325</td>
<td>1.38</td>
<td>0.128</td>
</tr>
<tr>
<td>Lower Middle Class</td>
<td>0.0358</td>
<td>0.96</td>
<td>0.0265</td>
</tr>
<tr>
<td>Lower Class</td>
<td>0.389</td>
<td>0.75</td>
<td>0.072</td>
</tr>
<tr>
<td>Occupation Status: Reference Category Salary earners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self employed</td>
<td>0.577</td>
<td>1.83</td>
<td>0.346</td>
</tr>
<tr>
<td>Professionals</td>
<td>0.405</td>
<td>1.48</td>
<td>0.213</td>
</tr>
<tr>
<td>Business men</td>
<td>0.662</td>
<td>1.92</td>
<td>0.354</td>
</tr>
<tr>
<td>Retired</td>
<td>0.112</td>
<td>0.88</td>
<td>0.109</td>
</tr>
<tr>
<td>Longitudinal Category: Reference Period = 2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>0.142</td>
<td>0.87</td>
<td>0.164</td>
</tr>
<tr>
<td>2010</td>
<td>0.232</td>
<td>0.79</td>
<td>0.098</td>
</tr>
<tr>
<td>2015</td>
<td>0.406</td>
<td>0.67</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Source: Primary Data

Analysis of risk tolerance of different groups of individual investors reveals some interesting information on risk tolerance of investors. The investors belonging to lower age group are comfortable with high risk and as the individuals become old, there is substantial reduction in their risk assumption capacity, which reflects in low tolerance score. Similarly, while male investors show higher risk tolerance in portfolio decisions, the risk assumption capacity of female investors is comparatively low. Businessmen belonging to occupational group exhibit the highest risk tolerance, which shows their enterprise and aggressive attitude in the investment programme. On the contrary, retired individuals show risk aversion characteristics who naturally dislike financial assets with high equity component. Similarly, as investors pass through bachelor to old empty-nest life cycle there is gradual and noticeable reduction in the risk tolerance. Likewise, investors in upper class and upper middle class are more comfortable with risk and lower social class segment also shows high risk aversion.

The multiple correlations between risk tolerance and demographic variables are analysed in this study to examine the degree of relationship between these variables. The multiple correlation between demographic variables such as income, age, education and risk tolerance and between the above mentioned variables and saving propensity is analysed. The demographic variables such as income, age, education have been taken as predictors (constant) and risk tolerance and saving propensity have been taken as dependent variables. The results of the analysis are presented in the following table.
P. Antony George

Table: 5 Multiple Correlation- Risk Tolerance and Other Demographic Variables

<table>
<thead>
<tr>
<th>Predictors (constant)</th>
<th>Dependant variable</th>
<th>Correlation</th>
<th>Standard error</th>
<th>Significance (5 percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Age Education</td>
<td>Risk Tolerance</td>
<td>0.573</td>
<td>9.238</td>
<td>0.025</td>
</tr>
<tr>
<td>Income Age Education</td>
<td>Saving propensity</td>
<td>0.546</td>
<td>8.8594</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Source: Primary Data

As per the results derived from the table, multiple correlations among demographic variables income, age, education and risk tolerance and saving propensity is significant. The result derived from multiple correlation analysis rejected the fourth hypothesis developed for the study Commutative logistic analysis presents odd ratio derived from logistic regression suggesting the relative effect at the values of other variable on the likelihood of the degree of risk tolerance. Geographic characteristics (location of individuals) and level of risk tolerance of individual investors reveals some interesting facts. Individuals in the southern region in India are only 96 percent as likely and in the eastern region are only 97 percent likely as otherwise similar individual investors to be willing to take substantial risk. However individuals in the northern region are 1.38 times as likely as otherwise similar individuals in central region. However individuals in the northern region are 1.53 times as likely as otherwise similar individual is central region. The logistic analyses also present a clear measurement and analysis of degree of risk tolerance of different demographic and psychographic categories of individual investors.

The model clearly illustrate the importance that geographic characteristics represented by culture and ethnic status and demographic characteristic on the financial behavior and risk tolerance of individual investors. The level of risk tolerance of individual investors in northern and eastern region is much higher in comparison to the love towards risk by individuals residing in other regions in India. The most probable reason for the willingness of individuals belonging to western and northern region to assume more risk may be their long term exposure to capital market and enterprising skill in business matters. As a matter of fact the presence of prominent stock exchanges and popular capital market intermediaries functioning in the region may trigger the financial curiosity of the individual investors to develop active participation and involved in capital market operation. In the light of the empirical results derived from first second and third null hypotheses are rejected.

Impact of risk tolerance on portfolio selection and financial preference.

The Impact of risk tolerance of individual investors on portfolio selection and Management is analysed the following section.

Table-6 Impact of Risk Tolerance on Portfolio Decision and Financial Preference

<table>
<thead>
<tr>
<th>Categories of Individual investors</th>
<th>Risk Tolerance Mean Value</th>
<th>Proportion of Equity in Portfolio</th>
<th>Preference for Capital Gain</th>
<th>Correlation P Value &lt;005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Average</td>
<td>4.32</td>
<td>15.5</td>
<td>3.82</td>
<td></td>
</tr>
<tr>
<td>Moderate Risk Loving</td>
<td>10.23</td>
<td>58.7</td>
<td>6.39</td>
<td></td>
</tr>
<tr>
<td>Risk Loving</td>
<td>16.24</td>
<td>72.5</td>
<td>8.43</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Source: Primary data

The above tables clearly suggest the strong correlation between the level of risk tolerance and portfolio selection and financial preference for forms of return. Individual investors who exhibit high risk tolerance prefer to create portfolio with risky financial assets especially equity. In the light of above result fifth null hypothesis has been rejected.

Clusters of individual investors

The different clusters of individual investors identified on the basis of Custer analysis and distinctive characteristics of these segments are presented the following table.

Table-7 Clusters of Individual Investors and their Financial Characteristics

<table>
<thead>
<tr>
<th>Profile of clusters</th>
<th>Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Benefits</td>
<td>Risk averse-conservative investors</td>
</tr>
<tr>
<td>Sought</td>
<td>• Long term financial return</td>
</tr>
<tr>
<td></td>
<td>• High safety of investment</td>
</tr>
<tr>
<td></td>
<td>• Costless service</td>
</tr>
<tr>
<td></td>
<td>• Guaranteed return</td>
</tr>
<tr>
<td></td>
<td>Moderate risk-loving professional investors</td>
</tr>
<tr>
<td></td>
<td>• Flexibility</td>
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<tr>
<td></td>
<td>• Time convenience</td>
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<tr>
<td></td>
<td>• Simple and transparent service</td>
</tr>
<tr>
<td></td>
<td>• Expect financial advice</td>
</tr>
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<td></td>
<td>• Medium term gain</td>
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<tr>
<td></td>
<td>Risk loving aggressive investors</td>
</tr>
<tr>
<td></td>
<td>• High return</td>
</tr>
<tr>
<td></td>
<td>• Flexibility and liquidity</td>
</tr>
<tr>
<td></td>
<td>• Speedy, prompt services</td>
</tr>
<tr>
<td></td>
<td>• Short term gain</td>
</tr>
</tbody>
</table>
According to the table, three prominent clusters emerge from the cluster analysis of individual investors.

**Cluster-I.** risk averse conservative investors is a pre-eminent group of investors having the least risk tolerance who adopts a very cautious approach in portfolio investment decisions. They want personal care and individualised attentions and relationship marketing in financial services seems to be very effective in satisfying their specific financial requirements. Safety of investment and assured return are the main considerations of these conservative investors who do not compromise with modern approach in portfolio management. High price sensitivity, very low appetite towards risk and long term financial solvency are some of the distinctive characteristics of this cluster.

**Cluster-II.** moderate risk loving professional investors are very particular in following a professional approach in their financial planning and portfolio management. Analysis of distinctive characteristics of this cluster divulges the professional touch in their financial decision making. They believe in the superior benefits of consultation with experts and innovative approach in portfolio management. They always have a moderate view on financial matters, which is very clear from the moderate risk tolerance and moderate price sensitivity.

**Cluster-III.** risk loving aggressive investors exhibits aggressive characteristics in all dimensions of the investment activity and portfolio decision. High risk tolerance is the most important characteristic feature of this cluster who always expects exceptional return from their portfolio. Generally they want high degree of flexibility and liquidity in portfolio, and also expect speedy and prompt customer service from FIs. If the employees of the FIs are not knowledgeable and skilled, it will definitely displease this dynamic and futuristic-min segment.

**Managerial implications of the study**

The result of risk tolerance analysis is very important from a managerial point of view, especially for portfolio managers of mutual fund to develop innovative financial products. As per the financial planning -fundamental, the mutual fund manager has to ascertain risk tolerance of different group of customers to design and market suitable financial package in accordance with the customers' risk tolerance. The risk associated with holding common stock

<table>
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<tr>
<th>Distinctive Characteristics</th>
<th>Moderate risk tolerance</th>
<th>High risk tolerance</th>
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</thead>
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<tr>
<td>• Price sensitivity</td>
<td>• Consultation with financial experts</td>
<td>• Price sensitivity</td>
</tr>
<tr>
<td>• Very low risk tolerance</td>
<td>• Strategical approach in portfolio management</td>
<td>• Confident financial decisions</td>
</tr>
<tr>
<td>• Demanding</td>
<td>• Medium-term solvency consciousness</td>
<td>• Consultation</td>
</tr>
<tr>
<td>• Long-term solvency</td>
<td>• Self employed with low investment</td>
<td>• with experts</td>
</tr>
<tr>
<td>consciousness</td>
<td>• Housewives</td>
<td>• Short term solvency</td>
</tr>
<tr>
<td>• Least importance to capital gains</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Demographics Characteristics</th>
<th>Mixed age</th>
<th>Young/middle age</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Middle age/retiring people</td>
<td>• Moderate to high income</td>
<td>• Small family size</td>
</tr>
<tr>
<td>• Moderate income</td>
<td>• Small family size</td>
<td>• College/Professional education</td>
</tr>
<tr>
<td>• Large family size</td>
<td>• College/professional education</td>
<td>• Industrial employers</td>
</tr>
<tr>
<td>• General education</td>
<td>• Higher/intermediate</td>
<td>• Self-employed</td>
</tr>
<tr>
<td>• Self employed with low investment</td>
<td>• Professionals and managers</td>
<td>• Non-residents</td>
</tr>
<tr>
<td>• Housewives</td>
<td>• Non-residents</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial Attitudes</th>
<th>Optimistic view on financial matters</th>
<th>Short-term financial planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reliance on savings</td>
<td>• Preference for medium term financial instruments</td>
<td>• High multiple use of financial institutions</td>
</tr>
<tr>
<td>• Favourable attitude towards depositaries</td>
<td>• Medium-term financial planning</td>
<td>• Switching loyalty</td>
</tr>
<tr>
<td>• Aversion of credit</td>
<td>• No credit aversion</td>
<td>• High preference of equities</td>
</tr>
<tr>
<td>• Long-term financial planning</td>
<td>• Users of credit cards</td>
<td>• Heavy users of credit cards</td>
</tr>
<tr>
<td>• Expect only normal rate of return</td>
<td>• Shifting loyalty</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Savings behaviour and banking habits</th>
<th>Medium propensity to save</th>
<th>High propensity to save</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High preference for long-term financial products,</td>
<td>• Above average use of financial Institutions</td>
<td>• Multiple use of FIs</td>
</tr>
<tr>
<td>• Maintain account with number of number of banks</td>
<td>• Preference for investment intermediaries</td>
<td>• Accounts with number of bank</td>
</tr>
<tr>
<td>• Average use of financial Institutions</td>
<td>• Average number of credit Cards</td>
<td>• Very much interested in E-banking</td>
</tr>
<tr>
<td>• Below average number of personal loans</td>
<td>• Interested in E-banking</td>
<td>• Short/medium term investment objective</td>
</tr>
<tr>
<td>• Not interested in E-banking</td>
<td>• Medium term investment objectives</td>
<td></td>
</tr>
</tbody>
</table>
in portfolio is really the likelihood that the expected return will not materialize since individual investors reaction to judgment about uncertain events and establishing sense of the probability of future have systematic bias and distortions in the financial behavior and approach of the individual investors may not be realistic and judicious. Keeping in mind these realities the policy makers and authorities in financial market should endeavor to investigate different dimensions of the issue to have a balanced and judicious understanding different problems faced by individual investors. Even though scientific qualification and measurement of risk associated with portfolio decision is practically difficult, the authorities at the top of the financial system may seriously review this complex issue in the financial market and initiate measures that build necessary confidence and rationally in the financial behaviour of individual investors.

4. CONCLUSION

The findings of the study unambiguously reveals that the risk tolerance of individual investors strongly influence the portfolio decision and certain demographic characteristics of individual investors, make remarkable variations in the level of risk tolerance, portfolio selection and financial preference by individual investors. The investment in securities and portfolio decision is futurist oriented and emotional and naturally subject to cognitive biases. One of the notable findings that should bear in mind is that individual investors do not react consistently when they face risk in portfolio decision. More importantly, in general individual investors seek risk to avoid loss which is certain albeit avoid risk while seeking gain. This disproportionality of individual’s risk tolerance as compared to pleasure in getting financial gains may lead to unrealistic approach in portfolio decision leading to inefficiencies and state of confusion and lack of order in the capital market and reduction in wealth of investors. Therefore financial behavior and risk tolerance of individual investors may be appropriately transformed to make portfolio decision sensible logical and judicious. The superior brain and market intelligence alone do not guarantee generation of extra financial gain from capital market rather emotional maturity manifested in balanced risk tolerance, diligence, patience and contrary thinking positively help individual investors to have sensibility and confidence to enter capital market which make possible creation of millions of equity centric portfolio by investors that will strengthen Indian financial system and enhance prosperity and welfare of one and all.

REFERENCES

CRISIS PREPAREDNESS OF A PRIVATE ORGANIZATION

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ABSTRACT

The study is about crisis preparedness of the organization. It answered statement of problem such as to what extent the crisis preparedness of the organization in terms of detection, prevention, damage control, restore and lesson gained. It used the descriptive research design, take samples from its previous and senior staff as respondents to questionnaires. Data were processed using weighted mean, standard deviation, and t test to test the hypothesis of comparing groups of respondents. Results showed that, effective in term of the detection, prevention, damage control, restore and proactive in lesson gained. The implication of the result of the study, organization is effective. This result saying that the management were effective on their operation. However must have to strive to be very effective.

1. INTRODUCTION

Crisis is an unpredictable event which disrupts an organization’s routine pattern of day–to-day life. (Sally, 2003) Crisis is inevitable in most situation, its people, business or organization in jeopardy or peril. Crisis may happened anytime in the organization, most of the time in unforeseen and unexpected time and places. When it strike organization is vulnerable to damages such as its resources human, material, capital and loss of opportunity, it is really a threat in the business. The magnitude of its effect to the damage is almost incalculable, leaving entities in great devastation such as accident which brings the businesses to great losses, collapse of operation, great burden to some among others. The present study aim to assess crisis preparedness of the private organization. To assess their sensitivity in detecting the on-set of the crisis. Particularly their detection (mechanism, or knowing early warning signs of crisis), prevention, damage control, restore (recover), and learning gained.

Background of the Study

The motivation of considering the present study it to understand the situation of the target company, to evaluate its system and practices, assessing their preparedness in the event crisis seep in to their system. It was an intention of the researcher to provide an eye opener to the business practices of the organization, their operation to help not only them but to the adjacent organization. Further, to investigate the specific organization, to create an awareness about the crisis, to let the executive consider the impact of the crisis in their operation of organization as a whole.

Conceptual Framework of the Study

- Below were the conceptual framework of the study.

![Conceptual Framework](image)

Figure 1.Conceptual paradigm

Figure 1.the conceptual framework of the study consist of five blocks, at the middle the assessment, will assess the inputs from the group of respondents such as the regular clients, and the senior staff. Regular clients are the one that secure the services of the organization, the senior staff are the worker in the organization. Assessment variables are the detection, prevention, damage control, restore, and the learning. Detection (early warning signs) the first stage of the crisis here the crisis in the organization is about to occur. This can be prevented if there is a good mechanism of early warning signs. Prevention - the second stage of the crisis this will aiming to stop the on-set of the crisis. Damage control, or a stage wherein the crisis was already launched in the organization, this stage is try to stop the enlargement of the effect of the crisis, that is, to contain its further damage to be done in the organization. Restore,
a stage of the crisis management, here the action is to eliminate gradually the presence of the crisis in the organization. Learning, the aftermath of the crisis gives a lot of ways to improve the system, to fill the gap, to amend the lack of control, to revisit the system or review the process and procedures in the organization so that to patch them to be more responding and better in the future. This stage of crisis management open the possibility of training, some activities to detect the impending crisis to come.

**Statement of the Problem:** Below were the statement of the problem of the study. (1) What is the profile of the respondents in terms of: Age, Gender, Education, Number of years in the company? (2) To what extent are the crisis preparedness of the organization in terms of: Detection, Prevention, Damage Control, Restore, Lesson Gained? (3) Is there significant difference on the perception of the two groups of respondents? (4) What are the problems encountered by the respondents? (5) What are the suggestions offered by the respondents in relation to the crisis preparedness of the organization? (6) What are the implications of the result of the study in the organization?

**Hypothesis:** Ho: There’s no significant difference on the perception of group of respondents

**Scope and delimitation of the Study:** The crisis preparedness of the organization will be a study that confines only within the kpcs consultancy organization, relating the experiences of its stakeholders. Its clients and staff.

**Significance of the Study:** Below were the significance of the study. To the organization. The study will help to identify the crisis of the organization they are about to experience. To the general public. The study will help in educating them with the framework of the crisis. To the other researcher. The study will help them in their quest of finding a study of this category. Further, it will enlighten them on the crisis that struck companies.

**Definition of Terms and Acronyms:** Detection – refers to the early warning manifestation of the crisis in the organization. Damage control – refers to the further abatement or containing the occurrence of the crisis from further growing. Restore – refers to the bringing back the original state before the occurrence of crisis.

2. **REVIEW OF RELATED LITERATURE AND STUDIES**

**Literature and studies**

A report about Coca-cola poisoning in Belgium, when this event occurred, the company’s poor response about this situation (lack of managing this damaging information), or Coca-cola’s inability to address this crisis have caused sales drop by 21 percent. (Campbell, 1999). In the study of Hartman(2011) His objective of study was the crisis management in the hotel industry in Finland to present situation for safety purposes. His concern was the process of developing crisis management plan. They examined facts coming from the government and other organization. Key issues were addressed by the studies, have noted some improvements. According to San (2013) His studies was to identify how companies manage crisis situation through Facebook. They resorted to external entities during selected crisis. The study reveal that if the observed companies had establish strategies for managing the crises and in what they choose to approach customer demands. They conclude that there is lack of research in the field of crisis management through this social media platform. In the study of Gabriel (2004) Investigating theory regarding areas affecting crisis management in social media. His findings, regarding what is important for companies, concerning crisis management. It is important for companies to monitor social media, to be quick in replying and to reply in a human, non corporate voice. He emphasize the importance of crisis plan. In the study of Sinha (2004) investigated factors the influence strategic decision making process, the strategy formation and selection during a crisis. The result shows that decision making during crisis follow a logical incrementalism path and not a linear sequential path. Decision making a crisis is influence by a host of factors such as uncertainty, politicization, formalization, and standardization. In the study of Castro (2014), examined to better comprehend the implications of events for existing knowledge crisis leadership. He focused his study to clarify the meaning challenges that define characteristic of extreme event crisis, the importance of effects of felt emotions in these events, and action in responding to extreme events. His study concludes the leadership is focused on life-saving, and instinctual or emotional responses.

**Synthesis** Literatures and studies cited above have greatly help the present study. However, the above literature and studies have discussed crisis management in slight detail on the crisis preparedness of the organization, have been limited to areas in the study of organizational crisis, such as gray areas which brings the present study.

3. **METHOD AND PROCEDURE**

**Research Design**

The study will be utilizing the descriptive type of research since it will be assessing the present or current state of crisis preparedness of the organization. *Descriptive method is designed for the investigator to gather information about present existing conditions.* (Sevilla, 1992, p.94).

Research Instrument Used The research instruments used in the research were the questionnaires, documentary analysis, and interview.
Interview were administered to selected respondents to verify if the reply were agreed to the questionnaires, to validate the response in the questionnaires. However, their response was not included in the data. Documentary analysis were used to examine the crisis preparedness of the organization. The study involves gathering information examining record (Sevilla, 1992, p. 108). Questionnaires were the main instrument, since this can get the opinion of the target respondents, and its is the most cost effective of getting data from the respondents, since they cannot be interfere with their time and not interrupting on them.

Data Gathering Procedure The data were taken from the qualified respondents. The researcher asked the help and consent of the administrative staff to conduct a study on their operation relating its crisis preparedness. Questionnaires were sent to the respondents through the staff of the kpcs consultancy, then retrieve the same questionnaires within a week span of time.

Samples and Sampling Techniques The samples of the study to be considered were 30. (Sevilla, 1992, p. 192). Sampling techniques to be used were the purposive sampling, sampling with a purpose (Sevilla, 1992, p. 190), since the respondents: clients have to be qualified such as they have been in the organization for at least a year, for the staff must be a bonafide employees in the organization and at least one year in the organization. (Martinez, 1992, p. 145).

Statistical Treatment of Data The statistical tool to be used in the research were as follows:

1. **Percentage** — was used to determine the weight of the variable. Relative to the number of respondents.
   \[ p = \frac{f}{n} \times 100\% \text{, Where: } p \text{- percentage, } f \text{- frequency, } n \text{- number of item} \]

2. **Frequency distribution** — this statistical tools were used to represent the quantity of the respondents.

3. **Weighted mean** — this statistical tools were used to determine the range of data in the interpretation.
   \[ x' = \frac{\sum}{N} \text{, Where: } x' \text{- weighted mean or average, } \sum \text{- sum, } N \text{- no. of responses} \]

4. **Standard deviation** — this statistical tools were used to determine the variability of the data representing the respondents opinion asked in the questionnaires. 
   \[ s = \sqrt{\frac{\sum(x-x')^2}{(n-1)}} \text{, Where: } s \text{- square root, } \sum \text{- summation, } x \text{- item value, } x' \text{- mean, } s \text{- standard deviation, } n \text{- number of item / value} \]

5. **Spearman rank correlation** — used in validating questionnaires.

\[ \rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)} \text{, Where: } d_i = \text{difference in paired ranks, } n = \text{number of cases and } i = \text{paired score. Spearman Rank correlation, } (\text{Statstutor, 2015}) .00-.19 \text{ “very weak”, } .20-.39 \text{ “weak”, } .40-.59 \text{ “moderate”, } .60-.79 \text{ “strong”, } .80-1.0 \text{ “very strong”} \]

6. **t-test** — was used to determine the significance of the perception of two groups of respondents considered in the study. (Punzalan, 1989). This test were used to determine if an observed difference between the averages of two groups is statistically significant. (Sevilla, 1992, p. 260). For calculating t value: Formula : 
   \[ t = \frac{x_1-x_2}{\sqrt{s_1^2/n_1+s_2^2/n_2}} \text{, where: } t = t \text{- test (for two tail), } x_1 \text{- mean of the first group, } s_1 \text{- standard deviation of the first group, } n_1 \text{- number of item in the first group, } x_2 \text{- mean of the second group, } s_2 \text{- standard deviation of the second group, } n_2 \text{- number of item in the second group, } \]

   For locating the t value in the table: df — degree of freedom;  Alpha set to 95% level of significance or 5% error Scale to be used in the interpretation of value. Likert scale: Scale and Interpretation are as follows:

<table>
<thead>
<tr>
<th>Scale</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.25</td>
<td>4.00 Very Effective / To a Great Extent</td>
</tr>
<tr>
<td>2.50-</td>
<td>3.24 Effective / Extent</td>
</tr>
<tr>
<td>1.75-</td>
<td>2.49 Moderately Effective / Moderate Extent</td>
</tr>
<tr>
<td>1.00-</td>
<td>1.74 Not Effective / Lesser Extent</td>
</tr>
</tbody>
</table>

4. **PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA**

Below were the presentation, analysis and interpretation of the data. What is the profile of the respondents in terms of profile?

Table 1: Distribution of Respondents According to Profile
To what extent are the suggestions for crisis preparedness of the organization in terms of detection, preparation, and prevention relevant?

Table 2 shows the distribution of respondents according to crisis preparedness detection stage. On this stage of crisis preparedness, the feedback mechanism designed for early warning sign of the organization has a standard deviation of 0.712 or the respondents have relatively agreed on their perception, and has a mean of 2.7 meaning it was Effective. On record or reports of personnel or stakeholders to be used for predicting future problem, there is a standard deviation of 0.780 which was relatively the same or the perception of the respondents was relatively agreed, and has a mean of 2.633 which was effective. On policies and rules that encourage early detection of problem, there is a standard deviation of 0.797 low variability meaning the respondents were agreed on their perception, and has a mean of 2.733 or interpreted as effective. On designated communication system for staffs and personnel, there is a standard deviation of 0.751 meaning that most respondents perceptions were agreed and has a mean of 2.767 or effective. On manual of operations in place, there is a standard deviation of 0.948 little bit higher which respondents quite not have unified perception and has a mean of 2.467 or moderately effective. On review of operations conducted, there is a standard deviation of 0.783 which is little bit high which the respondents were not unified on their perception and has a mean of 2.467 or moderately effective. Overall, the standard deviation although little bit high 0.795 meaning the respondents were not unified on their perception, however, this was take altogether, has a mean of 2.628 or effective.

Table 3 shows the distribution of respondents according to crisis preparedness prevention stage. On this stage of crisis preparedness, the feedback mechanism designed for early warning sign of the organization has a standard deviation of 0.712 or the respondents have relatively agreed on their perception, and has a mean of 2.7 meaning it was Effective. On record or reports of personnel or stakeholders to be used for predicting future problem, there is a standard deviation of 0.780 which was relatively the same or the perception of the respondents was relatively agreed, and has a mean of 2.633 which was effective. On policies and rules that encourage early detection of problem, there is a standard deviation of 0.797 low variability meaning the respondents were agreed on their perception, and has a mean of 2.733 or interpreted as effective. On designated communication system for staffs and personnel, there is a standard deviation of 0.751 meaning that most respondents perceptions were agreed and has a mean of 2.767 or effective. On manual of operations in place, there is a standard deviation of 0.948 little bit higher which respondents quite not have unified perception and has a mean of 2.467 or moderately effective. On review of operations conducted, there is a standard deviation of 0.783 which is little bit high which the respondents were not unified on their perception and has a mean of 2.467 or moderately effective. Overall, the standard deviation although little bit high 0.795 meaning the respondents were not unified on their perception, however, this was take altogether, has a mean of 2.628 or effective.
Table 3 shows the distribution of respondents according to crisis preparedness prevention stage. On safety procedures in place, its standard deviation were 0.753 quite low which means that the respondents were unified on their perception, the mean were 2.9 or effective. On training of staff or personnel anticipating future occurrence of system failure, its standard deviation were 0.907, almost high, respondents have varied level of responses, it mean of 2.6 or effective. On communication policy toward handling sensitive information that may disturb operation, the standard deviation 0.848 it means that respondents were not unified, it follows that the mean were low at 2.233 or moderately effective. On office that handle sensitive information, the standard deviation quite low variability it means that the respondents were unified on their perception, the mean were at 2.5 or effective. On fire or earthquake drill exercise among staff or personnel, the standard deviation were at 0.96, quite high, here the respondents were not unified on their view, the mean were at 2.33 or moderately effective. On program supporting preparation or prevention of the crisis, the standard deviation were at 0.93 it shows that the respondents view were disperse, the mean were at 2.4 or moderately effective. On community or stakeholders involvement, standard deviation were at 0.992, means that the respondents were not unified on their perception, mean were at 2.3 or moderately effective. Overall, standard deviation were at 0.854, it means that the respondents were not agreed, the mean were at 2.48 or moderately effective.

Table 4 Distribution of Respondents According to Crisis Preparedness Damage Control (containment) Stage.

| Table 4 Distribution of Respondents According to Crisis Preparedness Damage Control (containment) Stage. |
|---|---|---|
| **B. Prevention** | **Mean** | **Standard Deviation** | **Interpretation** |
| Safety procedures in place. | 2.967 | 0.753 | Effective |
| Training of staff/ personnel anticipating future occurrence of system failure. | 2.633 | 0.907 | Effective |
| Communication policy toward handling sensitive information that may disturb operation. | 2.233 | 0.848 | Moderately Effective |
| Office that handle sensitive information. | 2.500 | 0.688 | Effective |
| Fire / earthquake drill exercise among staff / personnel. | 2.333 | 0.960 | Moderately Effective |
| Program supporting preparation/ prevention of the crisis. | 2.433 | 0.903 | Moderately Effective |
| Community/ stakeholders involvement | 2.300 | 0.922 | Moderately Effective |
| Overall | 2.486 | 0.854 | Moderately Effective |

Legend: 3.25-4.00 Very Effective / To a Great Extent ; 2.50-3.24 Effective / Extent ; 1.75-2.49 Moderately Effective / Moderate extent; 1.00-1.74 Not Effective / Lesser Extent

Table 4 shows the distribution of respondents according to crisis preparedness damage control (containment) stage. On qualified personnel to attend the mitigation of problem, standard deviation were at 0.891, mean were at 2.7 or effective. On administrative policy for containment, standard deviation were at 0.686, mean were at 2.6 or effective. On facilities or equipment to be used for containing problem, the standard deviation were at 0.783, mean were at 2.5 or effective. On responsible personnel to attend immediate problem, the standard deviation were at 0.820, mean were at 2.667, effective. On designated office/Officer-in-charge responsible for containing problem, the standard deviation were at 0.733, mean were at 2.433, effective. On designated office/Officer-in-charge to attend accident among personnel, the standard deviation were at 0.930, mean were at 2.733, effective. On systems and procedure/practices during the incident, the standard deviation were at 0.949, mean were at 2.533, effective. On evacuation plan/procedure during the problem, the standard deviation were at 1.032, mean were at 2.733, effective. Overall, standard deviation were at 0.848, mean were at 2.600, effective.

Legend: 3.25-4.00 Very Effective / To a Great Extent ; 2.50-3.24 Effective / Extent ; 1.75-2.49 Moderately Effective / Moderate extent; 1.00-1.74 Not Effective / Lesser Extent
Apolo Bagunas & Irene Pineda-Villareal

effective. On responsible personnel to attend immediate problem, standard deviation were at 0.82, mean were at 2.66 or effective. On designated office or officer in charge responsible for containing problem, standard deviation were at 0.733, mean were at 2.43 or moderately effective. On designated office or officer in charge to attend accident among personnel, standard deviation were at 0.93, mean were at 2.733 or effective. On systems and procedure or practice during the incident, standard deviation were at 0.949, mean were at 2.533 or effective. On evacuation plan and procedure during the problem, standard deviation were at 1.032, mean were at 2.733 or effective. Overall, standard deviation were at 0.848, this shows that view of respondent on the is quite varied, mean were at 2.6 or effective as far as the damage control on the crisis preparedness.

Table 5 Distribution of Respondents According to Crisis Preparedness Restore (recovery) Stage.

<table>
<thead>
<tr>
<th>D. Restore (recovery)</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Officer-in-charge that handle maintenance of operation.</td>
<td>2.633</td>
<td>0.8245</td>
<td>Effective</td>
</tr>
<tr>
<td>Sustainable support of organization until restoration.</td>
<td>2.5667</td>
<td>0.6859</td>
<td>Effective</td>
</tr>
<tr>
<td>Policies/Practices for restoring.</td>
<td>2.5667</td>
<td>0.8290</td>
<td>Effective</td>
</tr>
<tr>
<td>Logistics support for recovery.</td>
<td>2.6000</td>
<td>0.7831</td>
<td>Effective</td>
</tr>
<tr>
<td>Organizational commitment for recovery.</td>
<td>2.7333</td>
<td>0.8495</td>
<td>Effective</td>
</tr>
<tr>
<td>Overall</td>
<td>2.620</td>
<td>0.794</td>
<td>Effective</td>
</tr>
</tbody>
</table>

Legend: 3.25-4.00 Very Effective / To a Great Extent ; 2.50-3.24 Effective / Extent ; 1.75-2.49 Moderately Effective / Moderate extent; 1.00-1.74 Not Effective / Lesser Extent

Table 5 shows the distribution of respondents according to crisis preparedness restore (recovery) stage. On office or officer in charge that handle maintenance of operation, the standard deviation were at 0.825 this shows that respondents were little bit differ on their perception, mean were at 2.63 or effective. On sustainable support of organization until restoration, its standard deviation were at 0.6859 here the respondents perception quite unified on their view, mean were at 2.59 or effective. On policies or practices for restoring its standard deviation were at 0.829, quite high the perception of respondents were varied to some extent, mean were at 2.567 or effective. On logistics support for recovery, its standard deviation were at 0.7831 quite low or view of respondents were unified, mean were at 2.6 or effective. On organization commitment for recovery, its standard deviation were at 0.8495 which is quite high, the view of respondents were disperse, mean were at 2.733 or effective. Overall, standard deviation were at 0.794 shows that the view of the respondents on the recovery stage were unified. Mean were at 2.62 or respondents view were effective.

Table 6 Distribution of Respondents According to Crisis Preparedness Lesson gained Stage.

<table>
<thead>
<tr>
<th>E. Lesson gained</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour modification after the crisis.</td>
<td>2.633</td>
<td>0.7800</td>
<td>Effective</td>
</tr>
<tr>
<td>Proactive action after the incident.</td>
<td>2.3667</td>
<td>0.7689</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td>Problem / crisis documentation for dissemination.</td>
<td>2.5667</td>
<td>0.8696</td>
<td>Effective</td>
</tr>
<tr>
<td>Review of policy /procedure after the incident.</td>
<td>2.4000</td>
<td>0.8625</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td>Implementation of the corrective action.</td>
<td>2.6667</td>
<td>0.8200</td>
<td>Effective</td>
</tr>
<tr>
<td>Overall</td>
<td>2.527</td>
<td>0.820</td>
<td>Effective</td>
</tr>
</tbody>
</table>

Legend: 3.25-4.00 Very Effective / To a Great Extent ; 2.50-3.24 Effective / Extent ; 1.75-2.49 Moderately Effective / Moderate extent; 1.00-1.74 Not Effective / Lesser Extent

Table 6 shows the distribution of respondents according to crisis preparedness prevention stage. On behavior modification after the crisis it has a standard deviation of 0.780 relative low variability of the respondents response which means that unified perception, the mean was 2.633 or effective. On proactive action after the incident, the standard deviation 0.7689 low variability or the respondents were unified on their perception, the mean were 2.36 or moderately effective. On problem or crisis documentation for dissemination, the standard deviation 0.8625 quite high variability, the respondents were highly divided on these criterion, has mean of 2.5667, which is marginal to
the respondents were not unified as far as this criteria, the mean were 2.67 or effective. Overall the standard deviation were 0.82, generally the respondents were not unified on their perception, the overall mean were 2.5 or effective. Respondents were believed that the organization were effective on their perception regarding the crisis preparedness.

Table 7 Distribution of Respondents According to Crisis Preparedness Variables.

<table>
<thead>
<tr>
<th>Crisis Preparedness Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection</td>
<td>2.628</td>
<td>0.795</td>
<td>Effective</td>
</tr>
<tr>
<td>Prevention</td>
<td>2.486</td>
<td>0.854</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td>Damage control</td>
<td>2.566</td>
<td>0.869</td>
<td>Effective</td>
</tr>
<tr>
<td>Restore</td>
<td>2.620</td>
<td>0.794</td>
<td>Effective</td>
</tr>
<tr>
<td>Learning gained</td>
<td>2.527</td>
<td>0.820</td>
<td>Effective</td>
</tr>
<tr>
<td>Overall</td>
<td>2.527</td>
<td>0.820</td>
<td>Effective</td>
</tr>
</tbody>
</table>

Legend: 3.25-4.00 Very Effective / To a Great Extent ; 2.50-3.24 Effective / Extent ; 1.75-2.49 Moderately Effective / Moderate extent; 1.00-1.74 Not Effective / Lesser Extent

Table 7 shows the distribution of respondents according to crisis preparedness prevention variables. Data shows that most of the variables were effective except to the prevention. Overall, it was effective. This shows that the respondents view of the crisis preparedness of the organization is sound and manage the business effectively.

I. Is there significant difference on the perception of the two group of respondents? There’s no significant difference on the perception of the two group of respondents (regulars clients and the senior staff) as far as their view on the crisis preparedness of the organization.

II. What are the problems encountered by the respondents?

Below are the problems encountered by the respondents as far as the crisis preparedness of the organization. Problems on power shutdown, Absence of written policies Long que on payment, No assembly point, for fire service, No emergency no. to cell in case of fire or accident, Long queue on payment

III. What are the suggestions offered by the respondents?

a. More awareness about health and safety
b. There should be periodical drills for emergency, evacuation and restoration

IV What are the Implication of the result of the study in the status of Crisis preparedness of the organization?

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Findings: (1) In terms of profile. The table shows that, for 18 years and below age bracket was 1 or 3%, 19-24 years age bracket were 4 or 13%, 25-30 years age bracket were 9 or 30%, 31-25 years age bracket were 8 or 27%, 36-40 years age bracket were 5 or 17%, 46 and above years age bracket was 1 or 3%, a total of 30 or 100%. Note that majority of the respondents age bracket were 25-30, followed by 31-25, then by 36-40 age bracket. It shows that most of the clients and staffs were in middle age. In terms of gender, majority of clients and staffs were Male respondents was 19 or 63%. Female respondents were 11 or 37%. In terms of Educational attainment of respondents, most of the respondents were college level 15 or 50%, then followed by college graduate and Masters degree holder each were 5 or 17%, then by Ph.D graduate were 3 or 10%, then by Masters Level were 2 or 7%. Data shows that most of the staff or client were on college level. In terms of number of year of most of clients and staff, one year were 2 or 7%, then more than one year were 28 or 93%. (2) On crisis preparedness detection stage. On this stage of crisis preparedness, the feedback mechanism designed for early warning sign of the organization has a standard deviation of 0.712 or the respondents has relatively agreed on their perception, and has mean of 2.7 meaning it was Effective. On record or reports of personnel or stakeholders to be used for predicting future has a standard deviation of 0.78 which was relatively the same or the perception of the respondents is relatively agreed, and has a mean of 2.633 which was effective. On policies and rules that encourage early detection problem has a standard deviation of 0.797 low variability meaning the respondents were agreed on their perception, and has a mean of 2.733 or interpreted as effective. On designated communication system for staff and personnel has a standard deviation of 0.751 meaning that most respondents perceptions were agreed and has a mean of 2.767 or effective. On manual of operation, has standard deviation of 0.948 little bit higher which respondents quite not have unified perception and
has a mean of 2.467 or moderately effective. On review of operations conducted has standard deviation 0.783 which is little bit high which the respondents were not unified on their perception and has a mean of 2.467 or moderately effective. Overall, the standard deviation of the occurrence of system failure, its standard deviation were 0.907, almost high, respondents have varied level of responses, a mean of 2.6 or effective. On communication policy toward handling sensitive information that may disturb operation, the standard deviation 0.848 it means that respondents were not unified, it follows that the mean were low at 2.233 or moderately effective. On office that handle sensitive information, the standard deviation quite low variability it means that the respondents were unified on their perception, the mean were at 2.5 or effective. On fire or earthquake drill exercise among staff or personnel, the standard deviation were at 0.96, quite high, here the respondents were not unified on their view, the mean were at 2.33 or moderately effective. On program supporting preparation or prevention of the crisis, the standard deviation were at 0.93 it shows that the respondents view were disperse, the mean were at 2.4 or moderately effective. On community or stakeholders involvement, standard deviation were at 0.992, means that the respondents were not unified on their perception, mean were at 2.3 or moderately effective. Overall, standard deviation were at 0.854, it means that the respondents were not agreed, the mean were at 2.48 or moderately effective. On crisis preparedness damage control (containment) stage. On qualified personnel to attend the mitigation of problem, standard deviation were at 0.891, mean were at 2.7 or effective. On administrative policy for containment, standard deviation were at 0.686, mean were at 2.6 or effective. On facilities or equipment to be used for containing problem, standard deviation were at 0.783, mean were at 2.5 or effective. On responsible personnel to attend immediate problem, standard deviation were at 0.82, mean were at 2.667 or effective. On designated office or officer in charge responsible for containing problem, standard deviation were at 0.733, mean were at 2.43 or moderately effective. On designated office or officer in charge to attend accident among personnel, standard deviation were at 0.93, mean were at 2.733 or effective. On systems and procedure or practice during the incident, standard deviation were at 0.949, mean were at 2.533 or effective. On evacuation plan and procedure during the problem, standard deviation were at 1.032, mean were at 2.733 or effective. Overall, standard deviation were at 0.848, this shows that view of respondent on the is quite varied, mean were at 2.6 or effective as far as the damage control on the crisis preparedness. On crisis preparedness restore (recovery) stage. On office or officer in charge that handle maintenance of operation, the standard deviation were at 0.825 this shows that respondents were little bit differ on their perception, mean were at 2.63 or effective. On sustainable support of organization until restoration, its standard deviation were at 0.6859 here the respondents perception quite unified on their view, mean were at 2.59 or effective. On policies or practices for restoring its standard deviation were at 0.829, quite high the perception of respondents were varied to some extent, mean were at 2.567 or effective. On logistics support for recovery, its standard deviation were at 0.7831 quite low or view of respondents were unified, mean were at 2.6 or effective. On organization commitment for recovery, its standard deviation were at 0.8495 which is quite high, the view of respondents were disperse, mean were at 2.733 or effective. Overall, standard deviation were at 0.794 shows that the view of the respondents on the recovery stage were unified. Mean were at 2.62 or respondents view were effective. On crisis preparedness prevention stage. On behavior modification after the crisis it has a standard deviation of 0.780 relative low variability of the respondents response which means that unified perception, the mean was 2.633 or effective. On proactive action after the incident, the standard deviation 0.7689 low variability or the respondents were unified, mean were at 2.467 or moderately effective. On fire or earthquake drill exercise among staff or personnel, the standard deviation quite low variability it means that the respondents were unified on their perception, the mean were at 2.59 or effective. On review of policy or procedure after the incident has high standard deviation 0.8625, means that the perception of the respondents were varied greatly, the mean were 2.4 or moderately effective. On implementation of the corrective action, its standard deviation were quite high at 0.82 which means that the respondents were not unified as far as this criteria, the mean were 2.67 or effective Overall the standard deviation were 0.82, generally the respondents were not unified on their perception, the overall mean were 2.5 or effective. Respondents were believed that the organization were effective on their perception regarding the crisis preparedness. (1) There were no significant difference on two group of respondents on the crisis preparedness of the organization. (2) The problems encountered by the respondents as far as the crisis preparedness of the organization were problems on power shutdown, Absence of written policies, Long que on payment, No assembly point, for fire service, No emergency no. to call in case of fire or accident, Long queue on payment. (3) The suggestions offered by the respondents More awareness about health and safety, There should be periodical drills for emergency, evacuation and restoration ( 4) The implication of the result of the study. The organization were in good shape as far as crisis preparedness. However, they must strive to pursed to be very effective and work hard on other specific variable where they were moderately effective. Further the organization have been manage as indicated on the problems encountered by the respondents.
5. CONCLUSIONS

1. Majority of the respondents were in the age bracket of 25-30 years representing 9 or 30%, 31-25 year which were 8 or 27%, 36-40 years were 5 or 17%, 19-24 years were 4 or 13%, 41-45 7%, 18 years & below and 46 & above were 1 or 3%.. Male respondents consist of 63% and female were 37%. Their education, majority of the respondents were college level 15 or 50%, Master’s graduate 5 or 17%, College graduate 5 or 17%, Ph.D Graduate 3 or 10%, and Master’s level 2 or 7%. In number of years been in contact with the organization, one year were 2 or 7%, and more than a year were 28 or 93%.

2. Respondents view on extent of crisis preparedness of the organization, in terms of detection it was effective, prevention moderately effective, damage control were effective, restore were effective and lesson gained were effective.

3. There’s no significant difference on the perception of two groups of respondents on the crisis preparedness of the organization.

4. Problems encountered by the respondents were as follows: problems on power shutdown, Absence of written policies, long queue on payment, no assembly point, for fire service, no emergency no. to cell in case of fire or accident, long queue on payment

5. More awareness about health and safety, there should be periodical drills for emergency, evacuation and restoration

6. The implication of the result of the study, organization is effective. This result saying that the management were effective on running their operation. However must have to strive to be very effective.

6. RECOMMENDATIONS

1. The present study should be conducted to same organization to verify the veracity of the result.

2. In the future, it will be suggested that, the other stakeholder (such as the suppliers, vendors, government) of the organization should be included in the study.

BIBLIOGRAPHY


A STUDY ON SWITCH IN CONSUMER ATTITUDE FROM SUPERMARKETS TO KIRANA STORES

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ABSTRACT

Emerging markets like that of India are too opportunity laden to be ignored. It carries with itself the promise of retail expansion opportunities, huge customer base, right competitive environment and a generation of young and able professionals who are able to afford the price of comfort. Over the past 10 years the Indian retail market has grown at the rate of 10% per annum and KPMG analysis points out that by 2015, 55% of Indian population will be under 20 years of age, strengthening the logical inference that the markets are more than ready for further opportunities. Indian government foresees the possibility of revenue generation by this sector and slowly but steadily it is moving towards full throttled participation by foreign retailers.

But all is not well on the supermarket scene. Many groups are going in for restructuring and change in formats because of losses borne by them. Instability of Indian rupee, insufficient space in cities forcing malls to be set up in far flung areas, lack of personal touch by retailers, too many confusing options and lack of credit could be some of the factors which are causing a dent in the profits of these giants. Indian economy is in the developing stage and the retail sector is in the peeking stage of the retailer’s growth curve. Every stage carries with it the consumer’s inclination towards a particular format style. There is a huge possibility that the Indian consumers will shift from supermarket format to kirana stores in their neighborhood wherein big brands would be charged for putting their brands on the store’s shelf. This study aims at assessing the attitude of consumers towards supermarkets and kirana stores in New Delhi based on five point likert scale in which each attribute was ranked from 1 to 5. These attributes have been the result of four focus group interviews and the representatives of these groups were customers who have been purchasing from kirana stores and supermarkets for the last six months. Judgment sampling technique was used in getting the questionnaires filled from 500 consumers, 250 consumers were contacted at various kirana stores and the remaining at various malls across the city. A total number of 360 complete questionnaires were obtained out of a total of 500 targeted.

The findings of the study regarding attitude of customers regarding supermarket and kirana stores is as follows:

- With increase in earning capacity of households (working couples), there was an increased focus on convenience and home delivery because of busy schedules
- The most interesting revelation was that consumers were very satisfied with the kind of relation they developed with the owner of the store
- Supermarkets were considered to be tiring and too much choice added to the confusion in selection of items
- Amongst women, those who preferred convenience stores were working and the non working women preferred supermarkets
- Men considered kirana stores to be more reliable as they could identify and speak with the owner of the store

This study indicates that a supermarket might have many benefits but the charm of our ‘just round the corner’ kirana cannot ever fizzle out. Consumer’s convenience in terms of strolling out in pyjamas for shopping, no parking payments and issues, the owners knowledge about the taste and preferences of all members in the family, availability of credit, home delivery and a personal rapport established, make consumer attitude towards kirana stores very favourable.

The study would prove to be an eye opener of sorts signaling the reverse trend from supermarkets to kirana stores where the responses analysed have clearly given leads to the factors which have contributed to this conclusion. In the days to come future research can be done on the theme of e-retailing and how online service portals can be used to further strengthen the web of retailers in providing instant services to the consumers. Retailers with huge and spread out formats should understand that consumer attitude towards the same is changing and because there are many kirana stores deeply woven in our residential areas, retailers could probably increase the consumers choice by offering more variety at lower prices through the process of collaboration with kirana store owners.
Keywords: Supermarkets, Kirana Stores, Attitude, e-tailing

AT Kearney’s annual Global Retail Development Index (GRDI) places India at the top position for the third year in a row as the most attractive market for retail investment. The retail industry in India is estimated to garner business to the level of $640 billion by 2015. But, this transition is not going to happen in a smooth way, every change brings along with it challenges and at the moment there is a tug of war between the Indian organized and unorganized retail sector. The motivation behind this study was the fact that the future of retail sector in India is inclining towards organized retail, while on the other hand our indispensible kirana stores continue to be deeply woven in the residential areas and a day without them would cause havoc and a situation of crisis in the lives of an average Indian. Despite the conducive government policies for organized retail we cannot ignore the paltry kirana stores which are resisting the competition fiercely and taking measures to strengthen their foothold in the market. While the role of organized sector in the economy cannot be denied, it is also true that according to figures cited by McKinsey Global Institute, the unorganized retail format provides employment to 39,500,000 individuals. Given the facts and the figures, there is no way that we can discount the original market flavor which lies deeply embedded in the Indian scenario.

Literature is replete with research which showcases the importance of supermarkets and also other modern formats of organized retail over unorganized retail. But, at the same there are hardly any studies which go on to show that consumer attitude is shifting from supermarkets to kirana stores.

Sanjeev Sanyal (2012) in his article published in Business Standard says that the debate over big retail is already outdated. These are the days of race between communication and transportation. The supermarket scenario has to change and bet on future with the help of online retail and neighbourhood kirana stores.

In words of Thomas Verghese, kirana stores would continue to maintain their strength and proposition for the Indian consumers and keep themselves relevant in Indian markets even long after international players come in (Darlington Jose Hector, 2012).

Spivak (2012) in his article “Whatever happened to mom and pop”, published in Daily News says that 21st century America has seen a change in retail formats but deep down we all know that we cannot survive these small stores.

According to Nielsen’s Shopper Trends – 2011 (Bhusan Ratna, 2010), the shoppers continue to render patronage to the local kirana stores. Traditional grocery stores are popular because of convenience, availability of home delivery and trusted relationships between the shopper and local grocer.

The findings of a survey done under the aegis of ASSOCHAM Social Development Foundation during March-April 2010 conducted in 15 major cities is enumerated by Varun Jain (2010) in his paper. The findings show that the masses in India prefer the local kirana stores over malls. We feel more comfortable with local traditional stores because of the familiarity with ambiance, ease of access, emotional attachment, early opening and late closing times etc., which suits the local residents.

Neeraj Thakur (2009) interviews with the customers show that if there is a local kirana store as compared to a supermarket in the same locality, customers prefers the local kirana store. The article differentiates the stores from organised retail outlets on different factors. The article highlights the unique features of kirana stores in terms of location, ownership, merchandise, pricing, customer-trust and other services.

Shubhra Saini (2009) finds that the mushrooming of malls, departmental stores, hypermarkets and supermarkets have not affected the market of the kirana stores much.


Dean and Sobel (2008) in their article “Has Wal Mart buried Mom and Pop” conclude that after examining both time series and cross-section data and employing different geographic levels of data and different econometric techniques, it can be firmly concluded that Wal-Mart has had no significant impact on the overall size and growth of U.S. small business activity.

NEED FOR STUDY

Government has the power to formulate policies and like in other countries it should play an important role in modernizing the unorganized sector and thus safeguard its existence and improve its competitiveness. However, the exact role of the government is not clear as in should it formulate policies for increasing participation in organized retail by curbing the protection given to unorganized retailers or vice versa. In this context it is highly imperative to develop an insight into the same by studying the attitude and pattern of the consumers buying behaviour. Keeping this in mind, the current study aims to evaluate the reasons for shift in attitude of consumers to kirana stores from...
supermarkets with a view to provide valuable information to the policy makers about the areas that need attention for improvement in policy making. Furthermore, it seeks to develop an analytical framework for the measurement of factors contributing to a shift towards kirana stores.

**METHOD**

**Instrument for survey**

Attitudes are likes and dislikes. Gordon W Alport defines an attitude to be a mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related. Adding to it, Milton Rokeach defined an attitude as a relatively enduring organization of beliefs around an object or situation predisposing a person to respond in some preferential manner. Attitudes are, thus, said to have a cognitive component, an emotional component and a behavioral component. Having an idea or belief about the object is the minimum condition for having an attitude with regard to it. As hypothetical constructs, attitudes cannot be measured directly. Any attempt to assess them can only be inferential in nature. Hence, taking lead from the pointers above the consumers were administered with a questionnaire, on the basis of which analysis regarding their shift in attitude was made.

A qualitative study comprising four focus group discussions and two in-depth interviews were conducted to identify the attributes about which the study shall revolve. The participants comprised those who were consumers and had been purchasing either from kirana stores or supermarkets for the last six months. The generated items with Eigen value of more than one were included resulting in 20 attributes. Each scale item comprised five opinions based on a five point Likert scale in which each attribute was ranked from 1 to 5. Here, 1 represents strongly disagree and 5 represents strongly agree. The primary data was collected through a well-structured questionnaire. The questionnaire was also translated from English to Hindi, the principal language of Delhi. It was pre-tested to ensure that the wording, sequencing of questions, length and range of scale were appropriate. Sometimes it became difficult for the respondents to answer the questionnaire due to low levels of literacy. In these situations, the administrator of the questionnaire came to help and guidance ensuring that the respondent is not influenced in any way.

**Subjects**

The study was conducted in the area of Delhi by dividing it into four zones: North, South, East and West. 250 consumers were contacted at various kirana stores and the remaining at various malls across the city. At times the malls were in far-flung areas and the local kirana was hard to locate. In such cases the nearest visible kirana was considered for questioning. Before administering the questionnaire, the meaning of the scale was explained to them. Despite tremendous efforts made by the researcher, a response rate of 72 per cent was obtained resulting in 360 complete questionnaires.

**RESULTS**

**Scale Properties**

Technique of factor analysis was employed to examine the structure of the relationship among variables representing the perceived attitude towards kirana stores as against malls in Delhi. Before running the factor analysis, the (KMO) Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett’s test of sphericity was performed. The generated score of KMO was of .87 and highly significant Bartlett’s test of sphericity supported the appropriateness of using factor analysis to explore the underlying structure of attitude of consumers towards unorganized retailing. An “Eigen Value of greater than 1” criterion was employed for determining the number of factors. In order to obtain more interpretable results solution, Varimax rotation was used to rotate the solution. This caused the loading to be distributed among the selected factors making it easier to interpret results. As a result, the factor loadings of more than .5 were considered as significant. As shown in Table1 the factor analysis of the 20 item scale on the basis of principal component extraction by using Varimax rotation converged in fourteen iterations and resulted in four homogeneous sub scales with Eigen Values of 4.212, 3.612, and 2.314. After rotation, the total variance came out to be 71.115 per cent. The communalities for the same after extraction ranged from 0.465 to 0.726. The factors with higher loadings were named as convenience, personal relations, availability of credit and quick billing. SPSS version 17 software was used for performing all statistical analysis.

The first subscale with Cronbach alpha 0.91 included eight items related to ‘convenience’: accessibility to store, can ask for products even if closed, opens early, parking hassles and charges, free home delivery, small shop floor, personalised service, return in case of unsatisfactory items. The second subscale ‘personal relations’ with Cronbach alpha 0.90 comprised five items related to: knowledge of the preferences of family members, tips on discounted items and schemes, request for exact product requirement, emotional vent out, exchange of personal products. The third subscale ‘availability of credit’ with Cronbach alpha 0.85 included five items: can carry forward the payment, guilt feeling, reminders and collection representatives, separate register for family members, maintenance of secrecy. The fourth subscale with Cronbach alpha 0.83 contained two items related to quick billing: absence of machines and print outs, faster manual calculation. The scale was tested for reliability. It had an overall Cronbach’s alpha value of 0.87.
0.95 that ranged from 0.712 to 0.912 for the subscales. The reliability was highest for ‘convenience’ (0.91) and lowest for ‘availability of credit’ (0.85). The overall mean score was 1.765.

Table 1: Factor Analysis of the Instrument

<table>
<thead>
<tr>
<th>Items</th>
<th>Components/Factors</th>
<th>Communalities after extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility to store</td>
<td>0.465</td>
<td>0.724</td>
</tr>
<tr>
<td>Can ask for products even if closed</td>
<td>0.552</td>
<td>0.718</td>
</tr>
<tr>
<td>Opens early</td>
<td>0.652</td>
<td>0.654</td>
</tr>
<tr>
<td>Parking hassles and charges</td>
<td>0.595</td>
<td>0.723</td>
</tr>
<tr>
<td>Free home delivery</td>
<td>0.758</td>
<td>0.721</td>
</tr>
<tr>
<td>Small shop floor</td>
<td>0.725</td>
<td>0.696</td>
</tr>
<tr>
<td>Personalised service</td>
<td>0.456</td>
<td>0.715</td>
</tr>
<tr>
<td>Return in case of unsatisfactory items</td>
<td>0.455</td>
<td>0.765</td>
</tr>
<tr>
<td>Knowledge of the preferences of family members</td>
<td>0.212</td>
<td>0.719</td>
</tr>
<tr>
<td>Tips on discounted items and schemes</td>
<td>0.124</td>
<td>0.709</td>
</tr>
<tr>
<td>Request for exact product requirement</td>
<td>0.254</td>
<td>0.714</td>
</tr>
<tr>
<td>Emotional vent out</td>
<td>0.247</td>
<td>0.717</td>
</tr>
<tr>
<td>Exchange of personal products</td>
<td>0.295</td>
<td>0.722</td>
</tr>
<tr>
<td>Can carry forward the payment</td>
<td>0.115</td>
<td>0.724</td>
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<tr>
<td>Guilt feeling</td>
<td>0.024</td>
<td>0.709</td>
</tr>
<tr>
<td>Reminders and collection representatives</td>
<td>0.116</td>
<td>0.726</td>
</tr>
<tr>
<td>Separate register for family members</td>
<td>0.374</td>
<td>0.721</td>
</tr>
<tr>
<td>Maintenance of secrecy</td>
<td>0.374</td>
<td>0.721</td>
</tr>
<tr>
<td>Absence of machines and print outs</td>
<td>0.457</td>
<td>0.654</td>
</tr>
<tr>
<td>Faster manual calculation</td>
<td>0.114</td>
<td>0.711</td>
</tr>
<tr>
<td>Percentage variance explained by factor after rotation</td>
<td>17.113</td>
<td>8.534</td>
</tr>
</tbody>
</table>

Table 2: Demographic profile of respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Male</th>
<th>Female</th>
<th>Total Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>270</td>
<td>90</td>
<td>360</td>
<td>75</td>
</tr>
<tr>
<td>Literacy</td>
<td>234</td>
<td>126</td>
<td>360</td>
<td>65</td>
</tr>
<tr>
<td>Income per month</td>
<td>36</td>
<td>126</td>
<td>198</td>
<td>10</td>
</tr>
<tr>
<td>≥ 3000</td>
<td>198</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>162</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 3000</td>
<td>198</td>
<td>55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To find out as to which demographic features contribute maximum to kirana store visits, the intention of the consumers to repeat visit was regressed against overall score on attitude in order to determine leading factors.
contributing to this switch and preference to unorganized retail format. For this purpose, linear regression model was employed to study the relationship between the intention to purchase from kirana stores (dependent variable) and the components of consumer attitude (independent variables). The findings indicate that the socio-economic profile of the respondents and other related factors was significantly associated with the intention to purchase from kirana (Table 3).

Table 3: Components of Consumer Attitude that Impact Purchases from Kirana Stores

<table>
<thead>
<tr>
<th>Components of Consumer Attitude that Impact Purchases from Kirana Stores</th>
<th>Constant</th>
<th>A</th>
<th>95% CI Lower</th>
<th>95% CI Upper</th>
<th>CON</th>
<th>B</th>
<th>0.25</th>
<th>PR</th>
<th>0.154</th>
<th>0.012</th>
<th>AC</th>
<th>B</th>
<th>0.021</th>
<th>QB</th>
<th>B</th>
<th>0.261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>0.668</td>
<td>0.625</td>
<td>0.712</td>
<td>0.25</td>
<td>0.154</td>
<td>0.012</td>
<td>0.261</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Gender</td>
<td>0.833</td>
<td>0.702</td>
<td>0.965</td>
<td>0.14</td>
<td>0.214</td>
<td>0.012</td>
<td>0.021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Gender</td>
<td>0.547</td>
<td>0.531</td>
<td>0.564</td>
<td>0.1</td>
<td>0.256</td>
<td>0.025</td>
<td>-0.012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age&lt;30 years</td>
<td>0.664</td>
<td>0.587</td>
<td>0.741</td>
<td>0.02</td>
<td>0.154</td>
<td>0.251</td>
<td>-0.012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age&gt;30 years</td>
<td>0.541</td>
<td>0.541</td>
<td>0.542</td>
<td>0.23</td>
<td>0.254</td>
<td>-0.012</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirana Store Preference</td>
<td>0.714</td>
<td>0.712</td>
<td>0.716</td>
<td>0.46</td>
<td>0.314</td>
<td>-0.011</td>
<td>0.121</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supermarket Preference</td>
<td>0.441</td>
<td>0.425</td>
<td>0.458</td>
<td>0</td>
<td>0.012</td>
<td>0.002</td>
<td>0.321</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income ≤ 1000</td>
<td>0.639</td>
<td>0.524</td>
<td>0.754</td>
<td>0</td>
<td>0.211</td>
<td>0.314</td>
<td>-0.003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1001-3000</td>
<td>0.576</td>
<td>0.568</td>
<td>0.584</td>
<td>0.02</td>
<td>0.112</td>
<td>0.211</td>
<td>-0.101</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3000</td>
<td>0.621</td>
<td>0.589</td>
<td>0.654</td>
<td>0.46</td>
<td>0.352</td>
<td>0.054</td>
<td>0.251</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uneducated</td>
<td>0.611</td>
<td>0.568</td>
<td>0.654</td>
<td>0.1</td>
<td>0.011</td>
<td>0.212</td>
<td>-0.021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upto class 8</td>
<td>0.697</td>
<td>0.574</td>
<td>0.821</td>
<td>0.25</td>
<td>0.214</td>
<td>0.022</td>
<td>0.202</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above class 8</td>
<td>0.62</td>
<td>0.584</td>
<td>0.657</td>
<td>0.35</td>
<td>0.213</td>
<td>-0.215</td>
<td>0.112</td>
<td></td>
<td></td>
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<td></td>
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</table>

Statistically significant at 0.05 level

For most of the variables, ‘convenience’ and ‘personal relations’ were seen to be significantly associated with the intention to visit a particular format of a store. It was observed that the two above mentioned factors significantly impacted the outcome among men and among women it was ‘convenience’, ‘personal relations’ and ‘quick billing’. The finding that among <30 year age group ,it is the ‘personal relations’ and ‘availability of credit’ that impacts the outcome, implies that the need for recognition, security and credit facility are most important factors with no association being shown with any of the other components .Interestingly, for the age group of >30 years, the most significant factors were ‘convenience’ and ‘personal relations’, thus implying that when consumers of a product are well settled, they already have their preferences made and simply look for stores which would make that brand available in their residential area itself. Also, because of the warmth and satisfaction derived out of good personal relations, the focus shifts from supermarkets to the nearest available kirana store. The outcome showed varying association with the components of store preference for different income groups. The factors ‘availability of credit’ and ‘personal relations’ mattered most for the respondents with income less than 1000.For those whose income was >3000, the dimension of ‘convenience’ was of utmost importance. For illiterates, only ‘availability of credit’ is significant but as the level of education increases, other variables such as ‘convenience’, ‘personal relations’ and ‘quick billing’ stand out to be statistically significant.

DISCUSSION AND CONCLUSION

The study examines the switch in consumer attitude from supermarkets to kirana stores through various malls and kirana stores across the city of New Delhi in India by using a 20-item scale. These factors had emerged after focus group discussions and in-depth interviews. The scale tested well for reliability with an overall Cronbach’s alpha value of 0.95.

The current study contributes to the understanding of consumer attitude and intention towards retail stores in comparison with supermarkets, adequate consideration has been given to critically analyse the factors influencing the shopping intention and attitude of the consumers when they make a buying decision in retail stores. A retailer must understand and know in detail, various factors that lead to shopping intention and attitude of the consumers. Keeping this objective in mind, a threadbare analysis has been done, the result of which, in turn, will completely equip the retailers to understand and comprehend the shopping intention and attitude of the consumers. This will help him to climb the high ladder in the market.
However, all said and done, the Indian consumer is coming of age and is exploring the area of online shopping. According to AT Kearney Retail E-commerce Index published in July 2012, despite the buzz around the scope of E-commerce in India, the country does not feature in the top ten emerging markets in this category. At the moment, this sector is in a flux. So, it is actually a very good time for the Indian kirana store owners to experiment and capture the market by involving their progenies and making the use of technology. Online facility at a kirana store will help them reap the profits of this untapped segment and also despite the glitches; e-tailing is here to stay.

The study is however limited to certain areas of Delhi. Therefore, it is suggested that similar studies be carried out in other urban areas of the country and this should include tier 2 and tier 3 cities as well. Further, researches could be conducted on modernization and e-tailing in kirana stores.

REFERENCES
EFFECT OF MODERATING PARAMETERS ON RELATIONSHIP BETWEEN QUALITY MANAGEMENT PRACTICES & ORGANISATION PERFORMANCE

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ABSTRACT

Purpose – Main aim of this study is to understand the relationship between quality management practices and organisation performance & how this relationship gets affected by various internal & external moderating parameters.

Design/methodology/approach - The empirical data was collected using a self-administered instrument that was distributed to forty two Indian manufacturing companies. The data was analyzed using descriptive statistics, ANOVA & Path Analysis in AMOS 19.0.

Findings - This study identifies that organisation size & certification status does not have significant effect on organisation performance & extent to which different QMPs are implemented in manufacturing organisation. But these QMPs do have effect on organisation performance in varying degree for each of QMPs. For example this study indicates that Management Commitment & Strategic Planning (Quality Planning) does not have direct effect on Quality & Profitability Performance of an organisation. But it does have positive effect on Schedule Performance. Similarly Customer Focus, Employee Relationship & Process Management has strong effect on Quality & Profitability Performance of the organisation. Though surprisingly but in line with few of past studies, this study indicated that Supplier Relationship does not have significant effect on Organisation performance. Also all these QMPs are highly correlated to each other. Hence their implementation is to be planned keeping this observation in mind. Major finding of this study is that Type of Order & Workload Situation does have moderating effect on QMP-Performance Relationship. This effect comes in the form of some QMP-Performance Relationship become stronger, weaker or being eliminated from the model.

Research limitations/implications - The research paper was limited by including only engineering manufacturing organisation. Also not all quality management practices were included. Making this a possibly biased selection and it may not be adequate to generalize the results for the entire manufacturing sector.

Originality/value - The study has contributed to the Quality Management literature with a better understanding of the quality management practices and how they affect organisation performance. Also better understanding of how this relationship gets impacted by various internal & external moderating parameters. This will provide valuable knowledge to owners of manufacturing companies, to refine their current quality management practices and subsequently improve organisation performance.

Keywords: Six-Sigma, TQM, Moderating Parameters, Path Analysis, ANOVA

1. INTRODUCTION

The emergence of quality management can be traced back to mid-nineties. Since then various quality management models has been considered as very important aspect of organisation (Porter & Parker, 1993). It had helped in improving effectiveness, efficiency & competitiveness of organisation. This result in superior overall performance & progresses the organisation to gain world-class status. However let us understand the available research on this subject starting with underlying theories related to Quality Management.

Numerous studies have confirmed the effect of implementing Quality Management Practices (QMP) on to organisation performance as summarised by Hale Kaynak (2003). The different approach used by researchers has produced varying results. To explain this variation in evidence, some researchers are examining a contingent approach to QMP-Performance relationship. This approach considers that many internal organisational aspects & external aspects do affect this relationship. Hence they have to be taken in to account as moderating factor of QMP-Performance relationship. So, this study aims at testing the QMP-Performance relationship and how this relationship gets affected by internal & external moderating parameters.
Statement of the Problem

QMP has a profound impact on all type of industry & many researchers in the past have tested the positive effect of implementing QMP on organisation performance (Hale Kaynak, 2003). But there are results which concluded other way (Claver and Tari, 2008). So, we have varying results for effect of QMPs on Organisation Performance. The reasons for the same are...

1. Implementation of QMPs
2. Internal & External Moderating Parameters

Hence some more empirical analysis is required to test QMP–Performance relationship based on the way QMPs are implemented & effect of moderating parameters on this relationship. Following objectives were defined for this study.

1. Analyse the QMPs being used in manufacturing organisations among different size & certification status of organisations
2. Analyse the effect of QMPs on organisation performance
3. Analyse the effect of internal moderating parameters on relationship between QMP- Performance
4. Analyse the effect of external moderating parameters on relationship between QMP-Performance

This study has been conducted under the following conditions.

1. The study will include organisation from engineering manufacturing sector.
2. Organisations will be classified as Micro, Small, Medium & Large based their investment in plant & machinery (MSME, 2013): Micro (Less than Rs 25 L), Small (Between Rs 25 L to Rs 5 Cr), Medium (Between Rs 5 Cr to Rs 10 Cr) & Large (More than Rs 10 Cr).
3. Geographically, data will be collected from manufacturing organisation operating in Mumbai Metropolitan Region (MMR) of India.
4. Organisation performance will be derived from performance of order being executed based on three aspects: schedule, quality & profitability derived from the completed order. This has been considered to avoid the effect of external business environment (mainly demand).
5. QMPs covered in this study will be from nine areas, which will be subsequently grouped in five QMPs. It based on their inclusion in past study.

2. THEORIES IN QUALITY MANAGEMENT

Way back in 1929 in his book Clarence Irving Lewis proposed that “knowledge is possible only where there is a possibility of error”. In the same book he mentioned that “knowledge is derived from learning caused by the interaction between the a priori with its conceptual modes and the sensuously given experience” (Lewis, 1929) Which means no knowledge is possible without interpretation (& reflection) of the experience based on our priori. This concept is clearly visible in Shewhart’s Specification-Production-Inspection (SPI) Cycle (Shewhart, 1939). Here specification comes from the priori knowledge, production will result in to experience & inspection will help in interpretation (& reflection) w.r.t original specification. This concept was used by many manufacturing organisation (mainly in Japan) in mid-nineties. Then in 1950 Deming added the word “Act” to this cycle. This is because as per Deming without Act (Improvement Action) the cycle will not result in to continuous improvement performance. This then becomes famous Plan-Do-Check- Act (PDCA) Cycle. Now it is well known that many quality techniques, programs & awards are based on these original thoughts given by these three researchers, finally resulting in to a PDCA cycle.

One of the important measures of quality is customer satisfaction. Let us understand one more theory which helps us in enhancing customer satisfaction. Based on theory of Motivation at Work (Herzberg, Bernard & Snyderman, 1959), Kano et al. (1979) developed concept called “M-H Property of Quality”. Here they explained that quality is not a one dimensional construct. This was further developed in to “Theory of Attractive Quality” (Kano et. Al 1984). As per this theory Kano explained that customer satisfaction is influence by five quality dimensions: attractive, one-dimensional, must-be, indifferent & reverse. Figure below shows, how these dimension influence customer satisfaction w.r.t their degree of achievement. So based on this theory we can design products (including service product as well) & its related services with the attribute comprises of above five dimensions. Now to have improvements in products & its services, one major action requires is problem solving. This in quality management is known as continuous improvement. However problem solving without any basis will results in to overload of actions on managers or quality responsible. Here comes the help of well-known Pareto Principle. As per this theory, it is observed that 80% of inefficiency is caused by 20% of the problems. So, first step in problem solving (continuous improvements) is to priorities the problem w.r.t to their impact on company’s performance.
Quality Management Practices

Above theories and few more kept on guiding researchers, managers & quality responsible to develop & use a practical tools or techniques, which we will call now as Quality Management Practices (QMP). In order to implement them in an organisation wide initiative, few models are developed. They are known as Quality Management Framework or Awards. For example: Deming Awards, Malcolm Baldrige National Quality Award, European Foundation of Quality Awards, Australian Quality Awards, etc. All these are commonly termed as TQM Models / Frameworks. In continuation of the quality improvement efforts various other models also emerged as ISO-9001, Six Sigma, Just-In-Time (JIT) Production System or Toyota Product System (TPS) etc. All these model / program / system / framework use combination of various QMPs.

In the past, many studies have used these practices in order to understand their usage & their impact on organisation performance. This section deals with understanding & classifying these QMPs. As summarised by Nair in his meta-analysis work on QMP-Performance relationship (Nair, 2005), various researcher have used different operational definition of quality management by including combinations of following QMPs.

List of QMPs (Martin & Lars, 2008)

<table>
<thead>
<tr>
<th>No</th>
<th>QMPs</th>
<th>No</th>
<th>QMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management Leadership</td>
<td>11</td>
<td>Quality Training</td>
</tr>
<tr>
<td>2</td>
<td>Employee Relationship / Involvement / Empowerment</td>
<td>12</td>
<td>Quality Information System</td>
</tr>
<tr>
<td>3</td>
<td>Customer Focus</td>
<td>13</td>
<td>Process Management</td>
</tr>
<tr>
<td>4</td>
<td>Supplier Relationship</td>
<td>14</td>
<td>Continuous Improvement</td>
</tr>
<tr>
<td>5</td>
<td>Quality Culture</td>
<td>15</td>
<td>Fact-based Management</td>
</tr>
<tr>
<td>6</td>
<td>Teamwork</td>
<td>16</td>
<td>Quality Design</td>
</tr>
<tr>
<td>7</td>
<td>Communication</td>
<td>17</td>
<td>Benchmarking</td>
</tr>
<tr>
<td>8</td>
<td>Social Responsibility</td>
<td>18</td>
<td>Knowledge Management</td>
</tr>
<tr>
<td>9</td>
<td>Quality Planning</td>
<td>19</td>
<td>Audits</td>
</tr>
<tr>
<td>10</td>
<td>Balance Score Card</td>
<td>20</td>
<td>Cost / Productivity Focus</td>
</tr>
</tbody>
</table>
All these QMPs can be classified as hard & soft (Abdullah et al. 2013). As per this criterion first eight QMPs of above table can be considered as soft practices. Mainly focusing on improving organisation environment to support actual quality improvement actions. These actions will be considered as hard practices. They are the rest of the practices in above table. One more way of classifying these QMPs is based on their involvement in Deming’s PDCA Cycle (Su et al. 2013).

Effect of QMPs on Performance

All above QMPs in various combinations have been considered in many studies to evaluate the impact on organisation performance. They are very well summarised by Hale Kaynak (2003) & in Meta-analysis done by Nair (2005). From these studies it is observed that QMPs do have positive effect on various organisational performance (Cheng & Choy, 2013), (Ali & Abedalfattah, 2013), (Abdullah, Kalil & Abdelmo’ti, 2011), (Pilar & Salome, 2010), (Hassan & Kerr, 2003), (Daniel & Amrik, 2003) and (Robin & Dennis, 1994). But effect on performance is not uniform & consistent. Mainly due to variation in how these QMPs are implemented. This in turn is driven by the objective of using a particular set of QMPs (Zhihai, 2011) & various barriers organisation faces in implementing these QMPs (Esin & Hilal, 2014). As per the classification explained in earlier section for these QMPs; research has been done to evaluate the effect of implementing hard QMPs vs Soft QMPs (Abdullah, Rushami & Rabul, 2013). However this study also concludes that hard & soft both QMPs have positive effect on organisation performance. One of important aspect of QMPs is its seriousness of implementation. Based on this it is proved that intensity of implementation of QMPs has positive effect on organisation performance (Masood et al. 2012) & (Chu-Hua, Christian & Chinho, 2001). This intensity was visible more in large organisation in comparison to small organisation (Masood et al. 2012). Since quality improvement actions were mainly associated with manufacturing sector. So, few studies were conducted specifically to understand the effect of QMPs on performance of manufacturing organisation. Here again positive effect was significant based on available data (Maria & Luise, 2007) & (Masood et al. 2013). Now taking this conclusion in Indian context, we do find the support in terms of positive effect of QMPs on performance of India organisations (Failsal, Zillure & Qureshi, 2012) & (Satish & Srinivasan, 2010). In contrast to the positive effect of QMPs on performance, we do have some observation, which do not support this claim completely (Zulnaiid & Zakaria, 2011), (Raja, Bodla, & Dr. Malik, 2011) & (Claver and Tari, 2008). One of the main reasons put forward is insufficient attention given by top management to the quality initiatives (Hale Kaynak, 2003).

Since major of quality improvement program / awards requires dedicated resources & attention. So, many studies have been done on large organizations, where these QMPs are used extensively. However Small & Medium Enterprise (SME) sector also had gone ahead with implementation of various QMPs. Here again we observed that QMPs do have positive effect on performance (Fazli, 2011) & (Fred, 2008). But similar to earlier observation not all study support this positive effect in totality (John & Ralph, 2013), (Kavin, Kristal & Robert, 2011) & (Anderson & Sohal, 1998).

Taking the quality improvement forward in the supply chain, some organisation have included supplier as one of the important element of their quality program and invest in building good relationship with supplier. It is observed empirically that this investment do pay-off in terms of improvement in overall organisation performance (Kitheka et al. 2013).

It is well understood that efforts in improving quality is long term investment. This implies that it requires some time for QMPs to start giving results. This factor of implementation period has been included in few studies. Results of those studies also support positive effect on performance observed by other studies (Alemu et al. 2011) & (George and Sherry, 1998). However these studies are based on secondary data or it is like case study on single company. Also not each QMPs period of implementation has been considered. So, further investigation on period of implementation for QMPs is required.

Effect of Moderating Parameters on QMP-Performance Relationship

We observed that studies have produced varying results. To explain this variation in evidence, some researchers are examining a contingent approach to QMP-Performance relationship. This approach considers that many moderating parameters do affect QMP-Performance relationship (Nair, 2005). Hence they have to be taken in to account.

Some of moderating factors which affects QMP-Performance relationship are for example person behavioral, learning, cultural aspects do moderate (Fco, Antonio, and Luis, 2003) and TQM Program (Daniel and Alan, 2006). Similarly in manufacturing sector also moderating parameters affects QMP-Performance relationship. For example, country culture (Phan, and Yoshiki, 2011); co-worker support & organisation support (Therese, 2007); size of firm, year of existence & top management commitment (Raja, Bodla & Malik, 2011) & supplier relationship (Brain & Chris, 2002).
But still these studies are limited & many more moderating parameters needs attentions in terms of their effect on QMP-Performance relationship.

Overall observations on above literature suggest that…

1. The QMP–Performance relationship is tested extensively mainly for large organisation, who have implemented some or other quality management programs (like TQM, ISO 9000, Six Sigma etc). But we do not find enough research on this subject for Small Scale Enterprises (SSE); especially from Indian context.

2. Effect of moderating parameters has been tested very minimally. Many more moderating parameters can be included in the study to understand QMP-Performance relationship in more refined way.

In order to address the above gaps following framework for this research study was used.

![Diagram](image)

Based on this framework, following hypothesis were tested.

H1: QMPs have positive impact on Organisational Performance.

H2: Workload situation (High or Medium or Low) in organisation has effect on QMP–Performance relationship.

H3: Nature of order (New or Repeated) has effect on QMP–Performance relationship.

3. METHODOLOGY

In order to fulfil the objectives set for this research study a combination of descriptive & explanatory quantitative design was used. Data for the same were collected from self administered online survey. This was followed by checking of scale reliability for QMPs Implementation Level & Organisation Performance Measures. Once the scale reliability was confirmed, then based on survey data, QMPs & Organisation Performance Variables were computed & their normality was checked.

It was observed in earlier study that QMPs and Performance Measure are interrelated, hence Path Analysis using AMOS 19.0 was conducted. For finding out moderating effect of Order Type & Workload Situation, Path Analysis was carried out using performance variables of different business conditions (based on order type & workload situation).

Dependent variables (i.e. performance of organisation) is measured directly based on feedback given by managers in survey form. However in order to include the effect of moderating variables, these dependent variables are measured for different condition of moderating variables.

| Dependent Variable – Performance Measures (along with Modating Variables) |
|-----------------------------|-----------------|-----------------|-----------------|
|                            | Quality Performance: | Schedule Performance: | Profitability: |
|                            | Percentage of Order | Percentage of Order | Percentage of Profit |
|                            | without Rejection   | within Delivery Time| Realized         |
| New Order                  | QP_NO              | SP_NO            | PP_NO           |
| Repeat Order               | QP_RO              | SP_RO            | PP_RO           |
| Work Load High             | QP_HW              | SP_HW           | PP_HW           |
| Work Load Medium           | QP_MW              | SP_MW           | PP_MW           |
| Work Load Low              | QP_LW              | SP_LW           | PP_LW           |
| Overall Performance        | QP_OA              | SP_OA           | PP_OA           |

For independent variables (i.e. QMPs), two step process was followed. Based on literature review and expert opinion, following QMPs were identified.
Inde\textit{pendent Variable – QMPs}

Scale reliability (Cronbach Alpha) for all performance variables was found in the range of 0.79 to 0.97. reliability for QMP variables was found in the range of 0.72 to 0.96.

\textit{Analyse of Overall Performance}

This analysis was performed to confirm that size of the organisation, quality system certification status does not affect the performance of these samples of organisations. Hence effect of QMP on Performance can be ascertained properly.

ANOVA indicated that none of performance variable has any significant difference across different size of organisation. ANOVA indicated that none of performance variable has any significant difference due to certification status of organisation.

\textit{Data Analysis - Effect of QMPs on Organisation Performance}

In order to find out effect of QMPs on Organisational Performance, it was required to find perfect model which can fit very well with available data.

To find out best fit model following process was followed.

1) Include all QMPs as Independent Variables

2) Include all Organisation Performance Measures as Dependent Variable. Since in many situations Quality (QP) has effect on Schedule (SP) & both in turn have effect on Profitability (PP). Hence QP & SP are also included as mediating parameters. This is shown with an arrow connecting QP \& SP, QP \& PP & SP \& PP.

3) Connect all QMPs to all three performance variables. This will ensure direct effect on each of this performance variables & also indirect on PP if any, through QP & SP.

4) Run Path Analysis in AMOS 19.0 & Check Model fit Parameters & Modification Indices (Covariance & Regressions).

\textit{Path Analysis (Overall – Initial Stage)}

5) To achieve acceptable levels of model fit parameter, we have to utilise information given in Modification Indices & Output Parameter. From Modification Indices – Covariance Table, identify highest M.I. value \& check logically if this connection can be established. If possible, than connect these QMPs with double arrow. Similarly from Output Parameter – Regression Coefficient Table, identify path where P value is highest \& above
0.05. Indicating that this particular path has no significant effect on performance measures. So, same can be removed from the model.

6) Repeat Step-4 & 5 till we get no suggestion in Modification Indices & all P value in Output Parameter Table are below 0.05.

7) At this stage, Model Fit Parameters should give reasonably acceptable level of values.

Following this process to start with following Path Analysis Diagram was used in AMOS 19.0. Also in this diagram path coefficient & R-Square values are indicated for the first run.

Few of the observations are...
1) MSP has no direct effect on QP & PP. Also it is highly correlated with EMP.
2) CST has direct effect on PP & QP. Also it is highly correlated with PRC.
3) EMP has direct effect on QP & PP.
4) PRC has direct effect on QP & PP.
5) Rest all direct effect of these four QMPs are not significant. Hence they are removed from the final model.
6) SPR has no effect on any of the performance parameters. Hence this QMP has been removed from the final model.

Path Analysis Model Output Parameters (Overall – Final Stage)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Overall Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized Regression Coefficient</td>
<td>CST --&gt; QP 1.21</td>
</tr>
<tr>
<td></td>
<td>EMP --&gt; QP -0.47</td>
</tr>
<tr>
<td></td>
<td>PRC --&gt; QP -0.76</td>
</tr>
<tr>
<td></td>
<td>MSP --&gt; SP 0.15</td>
</tr>
<tr>
<td></td>
<td>CST --&gt; PP -0.59</td>
</tr>
<tr>
<td></td>
<td>EMP --&gt; PP 0.27</td>
</tr>
<tr>
<td></td>
<td>PRC --&gt; PP 0.36</td>
</tr>
<tr>
<td></td>
<td>QP --&gt; PP 0.35</td>
</tr>
<tr>
<td></td>
<td>QP --&gt; SP 1.02</td>
</tr>
<tr>
<td></td>
<td>SP --&gt; PP 0.93</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>MSP &lt;-&gt; EMP 0.94</td>
</tr>
<tr>
<td></td>
<td>PRC &lt;-&gt; CST 0.87</td>
</tr>
<tr>
<td>Squared Multiple Correlations (R-Square)</td>
<td>Quality Performance 0.68</td>
</tr>
<tr>
<td></td>
<td>Schedule Performance 0.93</td>
</tr>
<tr>
<td></td>
<td>Profitability Performance 0.94</td>
</tr>
</tbody>
</table>

Some very important observations from Output Parameter are...
1) Out of all QMPs, Customer Focus has very high positive effect on Quality Performance.
2) But Employee Focus & Process Management are negatively affecting Quality Performance.
3) Quality has more positive effect on Profitability as compared to Schedule.
4) Customer Focus as negative effect on Profitability.
Now this final model was considered as basis for further analysis to identify effect of moderating parameters on this relationship.

Data Analysis - Effect of Moderating Parameter on QMP-Performance Relationship

In order to find out effect of moderating parameter on QMP-Performance relationship, dependent variables (QP, SP & PP) are used according to different business condition: New order Situation, Repeat Order Situation, High Workload Situation, Medium Workload Situation & Low Workload. Good of Fit Index for all these model was above 0.74. Summary of path coefficients are shown in table below.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Overall Model (OA)</th>
<th>New Order (NO)</th>
<th>Repeat Order (RO)</th>
<th>High Workload (H WL)</th>
<th>Medium Workload (MWL)</th>
<th>Low Workload (LWL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CST --&gt; QP</td>
<td>1.21</td>
<td>1.15</td>
<td>1.27</td>
<td>1.18</td>
<td>1.24</td>
<td>1.19</td>
</tr>
<tr>
<td>EMP --&gt; QP</td>
<td>-0.47</td>
<td>-0.49</td>
<td>-0.43</td>
<td>-0.42</td>
<td>-0.49</td>
<td>-0.45</td>
</tr>
<tr>
<td>PRC --&gt; QP</td>
<td>-0.76</td>
<td>-0.66</td>
<td>-0.87</td>
<td>-0.76</td>
<td>-0.76</td>
<td>-0.77</td>
</tr>
<tr>
<td>MSP --&gt; SP</td>
<td>0.15</td>
<td>0.15</td>
<td>0.17</td>
<td>0.21</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>CST --&gt; PP</td>
<td>-0.59</td>
<td>-0.51</td>
<td>-0.45</td>
<td>-0.37</td>
<td>-0.74</td>
<td>-0.58</td>
</tr>
<tr>
<td>EMP --&gt; PP</td>
<td>0.27</td>
<td>0.52</td>
<td>Not Sign.</td>
<td>0.37</td>
<td>0.27</td>
<td>0.41</td>
</tr>
<tr>
<td>PRC --&gt; PP</td>
<td>0.36</td>
<td>Not Sign.</td>
<td>0.52</td>
<td>Not Sign.</td>
<td>0.53</td>
<td>0.33</td>
</tr>
<tr>
<td>QP --&gt; PP</td>
<td>0.35</td>
<td>0.39</td>
<td>0.34</td>
<td>Not Sign.</td>
<td>0.77</td>
<td>1.23</td>
</tr>
<tr>
<td>QP --&gt; SP</td>
<td>1.02</td>
<td>1.01</td>
<td>0.96</td>
<td>0.93</td>
<td>1.00</td>
<td>0.99</td>
</tr>
<tr>
<td>SP --&gt; PP</td>
<td>0.93</td>
<td>0.93</td>
<td>0.72</td>
<td>1.05</td>
<td>0.53</td>
<td>Not Sign.</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSP --&gt; EMP</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>PRC --&gt; CST</td>
<td>0.87</td>
<td>0.87</td>
<td>0.87</td>
<td>0.87</td>
<td>0.87</td>
<td>0.87</td>
</tr>
<tr>
<td>Quality Performance</td>
<td>0.68</td>
<td>0.68</td>
<td>0.64</td>
<td>0.59</td>
<td>0.72</td>
<td>0.62</td>
</tr>
<tr>
<td>Schedule Performance</td>
<td>0.93</td>
<td>0.90</td>
<td>0.81</td>
<td>0.76</td>
<td>0.90</td>
<td>0.81</td>
</tr>
<tr>
<td>Profitability Performance</td>
<td>0.94</td>
<td>0.91</td>
<td>0.91</td>
<td>0.86</td>
<td>0.87</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Most important observations & possible reason for them are explained below...

1) New Order Situation: Effect of Process Management on Profitability has become not significant. This due the fact that in new orders normally new procedures are processes are required to be developed. Hence here compliance to requirement become primary objective & process development become outcome of that. This is also visible in the reduction of negative effect of CST on Profitability.

2) Repeat Order Situation: Effect of Employee Focus on Profitability has become not significant. In case of repeat orders, reliance on process is more as compared to people. This supported by increase in regression coefficient for PRC / SP & PRC / QP.

3) High Workload Situation: Effect of Quality of Profitability has become not significant.

This implies that major focus is on meeting schedule to maintain profitability. This supported by increase in coefficient values for SP / PP. To maintained Schedule & Profitability, importance of Management Commitment & Customer Focus is also increased. However surprisingly Process Management is also become not significant for its effect on Profitability. As it is expected that in case of High workload Situation, better processes will be an advantage to handle the situation. But counter view can be that, in such situation, out of the way solution will be more frequent & complying all process requirements may not be feasible to meet very tight schedule requirements.

4) Medium Workload Situation: Importance of Quality to have good Profitability has increased.

5) Low Workload Situation: Again here importance of Quality to have good profitability has increased. Also Schedule has not significant effect on Profitability. This because in Low Workload Situation, as such most of the customers are not in hurry & hence meeting deadline will not be as critical as in other workload situations.

4. DISCUSSION OF RESULTS

From the above analysis it was shown that organisation size & certification status does not have significant effect on organisation performance. This was also reported in study conducted by Georg (1998), Daniel (2006),
Pilar (2010) & Sana (2014). Similarly both these aspects (Organisation Size & Certification Status) do not have significant effect on the extent to which different QMPs are implemented in the organisation. However in the past few authors does indicated that TQM implementation status has resulted in higher implementation of QMPs in the organisations Raja (2011) & larger organisation also had similar effect on implementation of QMPs Masood (2012). Possible reason behind these contrasts will be that, in India many of the companies are acquiring ISO-9001 certification for the only purpose of getting marketing advantage or complying customer rules.

Based on the major observations from Path Analysis in previous sections, we have observed that Management Commitment & Strategic Planning (Quality Planning) does not have direct effect on Quality & Profitability Performance of an organisation. The similar results were shown by Raja (2011), Anderson (1998), where they conclude that this aspect of QMPs does not have significant effect on financial performance of the organisation. But in two of other studies results are not line with this, Hasan (2003) & Cheng (2013). However both of these studies were focused on very specific industries, namely Service & Shipping respectively. Hence conclusion from that study cannot be applied directly to manufacturing sector, which is the target area of study here. This study indicated that Customer Focus, Employee Relationship & Process Management has direct effect on Quality & Profitability Performance of the organisation & indirect effect on Schedule Performance (through Quality Performance). This observation is in line with many studies conducted in the past Anderson (1998), Hasan (2003), Ali (2013) & Kavin (2011). This study concluded that Supplier Relationship does not have significant effect on Organisation performance. This is in line with one of the study done on small & medium scale manufacturing organisation, Brain (2012). But in contrast to this, study conducted by Kavin (2011) does indicated that maintaining good relationship do have positive effect on organisation performance. However study conducted by Kavin, was on mainly on service sector. Which has different charateris as compared to manufacturing sector. Hence it is expected that result will vary. Since most of the QMPs are used as framework. That is they are to be used in relation to each other, as many of them are correlated. Here also it was shown that MSP & EMP are highly correlated & CST & PRC are highly correlated. Similar observation was made by Zulnaidi (2011), where it was shown that all QMPs are related to each other based on correlation analysis. Based on multiple Path Analysis it was concluded that Type of Order & Workload Situation as a moderating parameters does have effect on QMP-Performance Relationship. As these moderating parameters were not included in earlier studies, but we do find support for effect of moderating parameter on QMP-Performance Relationship as presented by Fco (2003) & Nair (2005).

In summary Most of the conclusions made in this study are supported by many of the past similar studies. In few cases observations are in agreement. But the difference here can be attributed to the sample on which those studies were conducted, mainly service sector or highly niece area like shipping. Also one more possible reason can be the geographic location from where these samples are collected. As current study is conducted on sample from India (Developing Economy) in contrast to many studies conducted in US & Europe (Developed Economy).

5. CONCLUSION

This study identifies that organisation size & certification status does not have significant effect on organisation performance & extent to which different QMPs are implemented in manufacturing organisation. But these QMPs do have effect on organisation performance in varying degree for each of QMPs. For example this study indicates that Management Commitment & Strategic Planning (Quality Planning) does not have direct effect on Quality & Profitability Performance of an organisation. But it does have positive effect on Schedule Performance. Similarly Customer Focus, Employee Relationship & Process Management has strong effect on Quality & Profitability Performance of the organisation. Though surprisingly but in line with few of past studies, this study indicated that Supplier Relationship does not have significant effect on Organisation performance. Also all these QMPs are highly correlated to each other. Hence their implementation is to be planned keeping this observation in mind.

Major finding of this study is that Type of Order & Workload Situation does have moderating effect on QMP-Performance Relationship. This effect comes in the form of some QMP-Performance Relationship become stronger, weaker or being eliminated from the model.

However to keep this study simple, not all QMPs were included & many of them were combined due to limitation of number of variable based on sample size for Path Analysis in AMOS 19.0. Hence broader sample with few additional QMPs will give better picture of QMP-Performance Relationship in manufacturing sector. Also in the sample of this study only engineering manufacturing companies were selected. Hence aspects related to other manufacturing sector may have impact on the conclusions made in this study. Also as a pilot study sampling of the companies were not random & mainly convenience based. However methodology used in this study can be applied effectively for better sample.
Further classification of companies within manufacturing can be based on Make to Order, Batch Manufacturing and Mass Production. As in these companies, different QMPs will have different effects. As far as moderating parameters are concern, there are many more parameters which can be included. However including them all together will make any study too complicated & difficult to generalise the result. So, it is suggested to include few moderating parameter at time & conduct multiple similar study.

REFERENCES


[37] 6(4), 67-72
A STUDY ON EMOTIONAL INTELLIGENCE AND JOB PERFORMANCE IN GOVERNMENT AUTHORITIES IN SULTANATE OF OMAN

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ABSTRACT

The study aimed to report the phenomena related to Emotional Intelligence (EI) and Job Performance among middle level management among government authorities in the sultanate of Oman. The study included middle level management officials from three government authorities in Oman. A combination of descriptive and conclusive research design was adopted. Standard questionnaires were used to collect the data from public authority offices in Oman pertaining to Emotional Intelligence and Job Performance respectively. Sample size was 73. SPSS was used to analyze the data. Descriptive statistics, item reliability, correlation and multiple regression analysis were administered by using SPSS version 20.00. Item reliability score reported was found higher and acceptable in both the instruments for data collection. Descriptive statistics revealed that the middle level employees working in government authorities scored more than the average in these two phenomena. It indicated that the middle level managers have high emotional intelligence and also have high perceived job performance in public authorities. Correlation analysis indicated a week and inverse relationship between Emotional Intelligence and Job Performance. It means these two phenomenons are loosely and inversely related among middle level managers in such organizations. The relationship between EI and Job Performance was also found relatively weak and insignificant from regression analysis. It indicates that emotional intelligence was weakly impacting the job performance among middle level managers in public authorities in Oman and the relationships were also reported insignificant.

Keywords: Emotional Intelligence, Job performance, Descriptive statistics, Regression analysis, Middle level

1. INTRODUCTION

The concept of emotional intelligence is one among the modern concepts that have entered the areas of organizational behavior and human resource management. The focus of the twentieth century has been on the traditional Intelligence Quotient or mental intelligence, and that as a determinants of the level of performance of employees in organizations, but recent studies have indicated that emotional intelligence is more important in determining the level of performance. However, scientists believe that the twenty-first century will see interesting studies on emotional intelligence and programs developed as an indicator of professional success and success in life in general.

Problem Statement

It is worth noting that the increasing number of studies that address the issue of emotional intelligence in the workplace in particular. Many of the researchers conclude their research findings that show the reliance on emotional intelligence in the selection of administrators in a group of companies and institutions factors led to improved performance and production, leaving behind the prominence of factors of knowledge and attitude. Emotional intelligence also explains why some workers vary in their levels of output and performance in spite of equality in regard to the mental capacity or experience and level of training. Based on this, the research problem aims at exploring the impact of emotional intelligence on the job performance of middle level managers in the government organizations in the Sultanate of Oman.

Is there a relationship between emotional intelligence and job performance at the middle level in the government authorities of Sultanate of Oman?

Theoretical Concepts and Framework:

Scientists and researchers have offered various definitions of emotional intelligence and Job Performance.

Hussein et. al. (2006, p. 35) defined Emotional Intelligence (EI) as an individual’s ability to recognize the emotions with others and identify the ability to show appropriate responses to environmental influences. Emotional intelligence is also about understanding the individual, conscious feelings and the control, management and awareness of the feelings and emotions of others, empathy and interact with them, and that the ability of acquired education and skills (Lynn, 2001, p: 2). One of the dimensions of EI is our ability to manage ourselves
and our relationships with others. Alsmaduna (2007, p. 42) identified EI as the ability to understand the internal feelings or emotional or sentimental cases to other people and sensations, and this is achieved through facial expressions or tones of voice or expressive behavior. Daniel Goleman was one of the most acknowledged scholars in this field. EI refers to an individual's ability to understand the emotions of others and friendly emotions, and knowledge of and discrimination between them, and the ability to adjust and deal with it positively, and the ability to self-motivate and manage emotions and relationships with others effectively (Hussain et. al., 2006, p. 28). Salovey and Meyer (2000) also defined Emotional Intelligence as a form of social intelligence that involves the ability to monitor one's own and others' feelings and emotions to discriminate among them and to use this information to guide one's thinking and action.

Job performance can be defined as all the behaviors employees engage in while at work (Jex 2002 p. 88). A fair amount of the employee’s behavior displayed at work is not necessarily related to job-specific aspects. It can be said that job performance refers to how well someone performs at his or her work.

Milkovich et. al. (1991, p. 48) conceptualized Job performance as complicated series of interacting variables pertaining to aspects of the job, the employee and the environment.

Framework:

2. REVIEW OF LITERATURE
Azim (2008) studied EI and its relationship with some emotional variables among university students. The study explored the relationship between emotional intelligence and emotional range of variables such as the point of control, self-esteem and shame. Sample size was 219 students from the third level of the Faculty of Education at Al Azhar University in Gaza. A significant difference between males and females in emotional intelligence was found. Males were having more EI compare to females. Jamila, et. al. (2008) studied the effects of emotional intelligence on management development in the context of the Lebanon. The study provided a practical estimate to the level of competencies on emotional intelligence (self-awareness, self-regulation, self-motivating, awareness and social skills). Sample size was 225 including employee and directors. The study identified different levels of emotional intelligence across demographic variables in the field of employment. Different Emotional Intelligence Quotient (EIQ) between males and females were reported. Males scored higher than females in self-motivate and organize estimates, where as female scored more on self-awareness, empathy and social skills. Suleiman et. al. (2007) studied Emotional Intelligence at work in UAE. The study explored the role of emotional intelligence and its impact on the work in the Arab world. Sample size consisted of 500 employees from 19 companies in the United Arab Emirates from three emirates namely, Abu Dhabi, Dubai and Sharjah. The results showed significant differences between staff awareness of emotional intelligence and conflict and their willingness to innovation and creativity. Study reported a significant correlation between education and employment and job level of emotional intelligence.

Faraj (2005) studied Emotional Intelligence and its relationship with the feelings of anger and aggression among university students in University of Alexandria. The sample consisted of 142 male and female students. The result reported statistically significant and inverse relationships between feelings of anger and emotional intelligence. Males have more feelings of anger and EI compare to females. Mohamed (2004) studied global components of emotional intelligence in a sample of academically outstanding students and non-students of secondary education. This study aimed to check the quality of matching the model presented by Bar-Own to the list of emotional intelligence ratio between outstanding and is excelling. The study sample consisted of 416 students from four schools of general secondary education. The result showed a partial match of the components of emotional intelligence as measured by Bar-Own list of outstanding. Males were found more on EI compare to females. The difference in EI between the sections reported. Hashim (2004) studied on Emotional Intelligence and its relationship to mental health among high school students. This study aimed to find the relationship between emotional intelligence and mental intelligence, gender, age and mental health in a sample containing the healthiest of students from public high schools in Ismailia governorate, ranging in age from 15 to 17 years. The results showed the direct relationship between emotional intelligence and mental intelligence. Emotional Intelligence grows with increase of age of teenagers. A statistically significant function links between the dimensions of empathy and regulation of emotions and mental health were also established.
Zidane et al. (2003) studied Emotional Intelligence and its relationship to some learning styles, and personal dimensions. Study aimed to detect the relationship between emotional intelligence and all of the learning and personal dimensions to the students of the Faculty of Specific Education, methods, and sample consisted of 355 male and female students. The results showed a positive relationship between emotional intelligence, extraversion. It also showed a negative relationship between emotional intelligence function and nerve. There found a positive relationship between emotional intelligence and learning styles. Saied (2003) aimed to identify the variation face the pressures skills contrast point of control or the control center (internal or external) as well as also of the objectives of the study indicate whether there has been the impact of interactive means for each of the emotional intelligence and control center and the type (male or female) to withstand the pressure skills. The sample was 526 students. The most important results was the existence of differences in the face of pressures skills depending on the different level of emotional intelligence and the presence of statistically significant differences in the face of pressures skills depending on the different gender. Haridi (2003) worked on individual differences in emotional intelligence in light of the vital variables. The study aimed to identify the core list of emotional intelligence designed by the researcher according to the model Bar-Own, and on the total sample of 149 individuals, including 90 males’ differences, single out females, and ranged in age from 18-56 years old. Study found all categories of women taken in the study by model Bar-Own Emotional Intelligence were credible with high stability but with simple differences because of cultural. Alsmaduna (2007) examined the relationship between emotional intelligence to the teacher and the compatibility of vocational and its impact relative to vocational teacher agrees. Study aimed to detect the effect of the gender and academic liaison and years of experience on the emotional intelligence among teachers. Sample size was 360 teachers from secondary school. Result showed a positive correlation between the emotional intelligence and professional compatibility. The results reported presence of gender differences in emotional intelligence among teachers.

The foreign Studies are as follows:
Law (2007) studied the impact of emotional intelligence on job performance and satisfaction with life scientists' research and development in China. The sample was taken from the Chinese computer company in Beijing. The company had more than 12,000 employees. The study corroborated the fact that emotional intelligence predicts the functional performance of employees. It also indicated that Emotional Intelligence was influential for high mental capacity on performance. Rajendran (2007) studied the assessment of emotional intelligence in the Indian work environment among 150 respondents from high-tech companies. The study significantly assessed emotional intelligence of the Indian work environment. It also assessed the stability of emotional intelligence scale prepared by Swinburne University, Australia. The result also confirmed Emotional Intelligence Scale stability in the Indian business environment. Ilarda & Findlay (2006) conducted the research to identify the role of emotional intelligence in predicting viability of individuals to work within a team. 134 people currently involved or have previously participated in teamwork were taken as a sample. Result showed a strong correlation between emotional intelligence and personal and reactivity towards working in a team. Burnette (2006) undertook the study to determine the levels of emotional intelligence among police officers and members of the police. The study sample consisted of 23 officers and 15 police members from the southern states of America. Study found no significant relationship and correlation between emotional intelligence levels of officers and police personnel in the southern states in America. Sy (2006) examined the relationship between emotional intelligence and job satisfaction. It also examined the relationship between EI and job performance of the employees and directors respectively. 187 employees and 62 directors were taken as a sample from nine restaurants from different locations having almost same degree of excellence. Study found a positive relation between emotional intelligence and satisfaction and job performance among employees. A positive correlation between emotional intelligence and job satisfaction among managers were reported. The correlation between the predictors and criterion was stronger among managers. Hayward (2005) studied the relationship between the performances of the users, leadership and emotional intelligence in the quasi-governmental organizations in South Africa. The study sample was 160 commander supervisory and 800 users. The research study founded a significant correlation between emotional intelligence and job performance. Similar findings were reported between EI and transactional leadership and transformational leadership. A strong linear relationship was found between emotional intelligence and transformational leadership. Viriyavidhayavongs &Jiamsuchon (2001) studied the relationship between emotional intelligence quotient and effective leadership in life insurance companies in Thailand. This study aimed to explore the relationship between emotional intelligence and effective leadership among managers .400 individuals from top four life insurance companies were taken for the study. Emotional intelligence were strongly linked with moral leadership effectiveness among managers in the study. The successful mangers were reported high on EI . Based on the review it can be concluded that the subject of emotional intelligence is still worthwhile to study and research as its effectiveness and relationship with factors such as Job Performance have been tested time and again on a variety of cross sectional professions and organizations. Culture of the country plays an important role in
emotional intelligence scale. Hence it was suggested while choosing the scale for the study the culture of the society should be clearly understood and the scale should be further adjusted accordingly. It can be observed from the literature studies mentioned above that multiple scales are used to determine the emotional intelligence quotient.

**Significance of Study:**
The significance of the study can be drawn from the simple fact based on review of literature that emotional intelligence has a direct impact on the quality of job performance. The area of study is relatively new in Omani context and draws attention to the academicians, industrialists and practitioners. The importance of the study applied to identify the nature of relationship between emotional intelligence and the quality of job performance and opportunities for professional success. The study of these two phenomena is a response to a new trend beginning to grow in organizational behavior and human resource management research in this part of the world. The study in this area is considered as a reference for students because it attempts to determine the levels of emotional intelligence and Job Performance among employees in governmental authorities in the Sultanate of Oman.

**Objectives of the Study**
- To study the phenomena related to emotional intelligence among middle level management of the government authorities in Sultanate of Oman.
- To study the phenomena related to perceived Job performance among middle level management of the government authorities in Sultanate of Oman
- To identify the relationship between Emotional Intelligence (EI) and perceived Job Performance (JP) among middle level management of government authorities in Sultanate of Oman.
- To identify the impact of EI (on perceived JP among middle level management of the government authorities in Sultanate of Oman.
- To provide recommendation and suggestion regarding these two variables to government authorities in Sultanate of Oman.

**Scope of the Study**
Scope of the study includes the government sector of government authority in general, and in particular includes middle management. The government authorities are independent in the administrative and financial affairs. This study aimed to examine the impact of emotional intelligence on the job performance among middle level management of the government authorities in the Sultanate of Oman. A varied mix of government organizations is included in the study.

3. **RESEARCH METHODOLOGY**

A combination of descriptive and causal research design was adopted to assess the level and impact of emotional intelligence on job performance among middle management employees in government authorities in the Sultanate of Oman. Descriptive research approach was used to report the accurate description of these two phenomena based on descriptive statistics. Causal research design was used to observe the relationship between EI and Job performance. Regression analysis was used to test the linear relationship between EI and Job Performance. The magnitude of the impact on Job Performance by EI was reported by the causal method. Sample consisted of middle management level employees in government authorities in the Sultanate of Oman. The number of respondents was approximately 200 individuals. It means sample frame is 200. The study was conducted in the coordination with the three different government authorities of Oman. 100 questionnaires were distributed and 73 were obtained from them. Sample size was 73.

**Data Collection Method(s)**
The researcher used both primary and secondary data:

1. A structured questionnaire by Dhar.U., Peth. S., Hyde. A., (2005) were used to collect the data on emotional intelligence. The researcher used questionnaire from university of the fraser vally, employee service, Canada 2011 to capture the data on perceived job performance.

2. Books, journals, research articles and online research databases available from the institutions were used for review of literature.

**Findings of the Study**
Questionnaire of emotional intelligence by Dhar et.al. (2005) consisted of 34 questions, while Questionnaire on job performance from university of the fraser valley, employee service, Canada, (2011) consisted of 20 questions.
The study conducted item analysis by using descriptive statistical method, using statistical analysis software SPSS (Version 20). Correlation analysis was used to observe the association between EI and Job Performance. Multiple regression analysis was used to see the linear relationship between the said variables. SPSS version 20.00 was used.

1. Test Cronbach Alpha for both EI and JP to see the items reliability of the questionnaire.
2. Descriptive (Mean, Average)
3. Correlation to see association between variables
4. Regression to see the effect of independent variable on dependent variable.

The Reliability of the questionnaire

Questionnaire intended to Reliability in various times and circumstances, in other words, they are suitable for distribution at any time, and withdraw the same results. Researcher has been made of the stability of the questionnaire through Cronbach's alpha coefficient as follows:

### 3.1.1.1 Questionnaire of Emotional Intelligence:

#### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.860</td>
<td>.873</td>
<td>34</td>
</tr>
</tbody>
</table>

### 3.1.1.2 Questionnaire of Job Performance:

#### Reliability Statistics

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.881</td>
<td>.879</td>
<td>20</td>
</tr>
</tbody>
</table>

The reliability coefficient value was found highly significant (0.860) for EI questionnaire that depicted high item reliability. Similarly for JP the reliability coefficient value was (0.881) and depicted high reliability. Reliability test was applied using SPSS 20.

### Descriptive statistics

Classification levels of emotional intelligence:

<table>
<thead>
<tr>
<th>Emotional Intelligence code</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong agree = 5</td>
<td></td>
</tr>
<tr>
<td>Agree = 4</td>
<td></td>
</tr>
<tr>
<td>Uncertain = 3</td>
<td></td>
</tr>
<tr>
<td>Disagree = 2</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree = 1</td>
<td></td>
</tr>
</tbody>
</table>

There are 10 factors to study in Emotional intelligence and Average score of EI:

<table>
<thead>
<tr>
<th>SR.No</th>
<th>Factor</th>
<th>Item serial number</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI_F1</td>
<td>Self-awareness</td>
<td>6,12,18,29</td>
<td>4.31</td>
</tr>
<tr>
<td>EI_F2</td>
<td>Empathy</td>
<td>9,10,15,20,25</td>
<td>4.09</td>
</tr>
<tr>
<td>EI_F3</td>
<td>Self-motivation</td>
<td>2,4,7,8,31,34</td>
<td>4.04</td>
</tr>
<tr>
<td>EI_F4</td>
<td>Emotional stability</td>
<td>14,19,26,28</td>
<td>4.11</td>
</tr>
<tr>
<td>EI_F5</td>
<td>Managing relations</td>
<td>1,5,11,17</td>
<td>4.01</td>
</tr>
<tr>
<td>EI_F6</td>
<td>Integrity</td>
<td>16,27,32</td>
<td>4.08</td>
</tr>
<tr>
<td>EI_F7</td>
<td>Self-development</td>
<td>30,33</td>
<td>4.28</td>
</tr>
</tbody>
</table>
From this table we can see the arithmetic mean of the variables in the identification of emotional intelligence, consisting of 10 elements, and we have seen that with the average (4.11) arithmetic elements rate is high, and that the majority of the sample was between their answers strongly agree, and agree. There is high level of emotional intelligence among the middle of government authority.

### Classification levels of Job Performance

<table>
<thead>
<tr>
<th>Response</th>
<th>Excellent</th>
<th>Good</th>
<th>Satisfactory</th>
<th>Sometime Unsatisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Average score of Job Performance was reported 4.33.

Descriptive statistics of job performance schedule is clear to us that the arithmetic mean is relatively high, and this also shows that the majority of their answers were excellent, and good. The average score of perceived job performance is coming as 4.33. It can be inferred that most of the employees have higher level of perceived job performance. Through these results we conclude that the middle level employee in government authority had high level of perceived job performance.

### Correlations

<table>
<thead>
<tr>
<th>EI</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
<th>JP_MEAN</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI</td>
<td>1</td>
<td>.876</td>
<td>73</td>
<td>-0.019</td>
<td>1</td>
<td>.876</td>
<td>73</td>
</tr>
<tr>
<td>JP_MEAN</td>
<td>-.019</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is clear that the simple linear correlation coefficient (Pearson) between emotional intelligence job performance for members of the study sample of (-0.019) with significance level 0.876. This indicates that Emotional intelligence and perceived job performance are very weakly and negatively and related. This is shown by the correlation value as -0.019. Also, the relationship between EI and Perceived Job Performance is not significant because the significance value is reported as 0.876 which is well above 0.05.

### Multiple regressions with EI factors:

#### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.417</td>
<td>.174</td>
<td>.041</td>
<td>.3629</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), EI_F10, EI_F9, EI_F5, EI_F7, EI_F8, EI_F1, EI_F4, EI_F6, EI_F2, EI_F3

b. Dependent Variable: JP_MEAN
ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1.718</td>
<td>10</td>
<td>.172</td>
<td>1.304</td>
<td>.248b</td>
</tr>
<tr>
<td>Residual</td>
<td>8.166</td>
<td>62</td>
<td>.132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9.884</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: JP_MEAN

b. Predictors: (Constant), EI_F10, EI_F9, EI_F5, EI_F7, EI_F8, EI_F1, EI_F4, EI_F6, EI_F2, EI_F3

The model summary table shows that the multiple correlation coefficient (R) using all the predictors simultaneously is 0.417 (R square = 0.174) and the adjusted R square is 0.041 meaning that 4.1% of the variance in JP_Mean can be predicted from EI factors.

Based on the result it can be inferred that Emotional intelligence (EI) is not significantly impacting Job performance because the variance explained is only 4.1 percent in the reported model. It can be said that if there is a change in Emotional intelligence there will be 4.1 percent change in job performance, which is very small. It can be inferred that EI do not affect Job performance of the middle level employees in the government authority. The relationship was also found insignificant because the significance value was reported as 0.248, which is very high compared to 0.05 level.

The ANOVA table shows that (F=1.304 and significance value = 0.248). The result indicated that the EI did not affect Job Performance significantly in the study in Omani context.

4. CONCLUSIONS

This chapter includes a summary of the most important results that have been reached through this study, in terms of strengths and weaknesses, and that contributes to the achievement of the desired objectives to improve the effectiveness of the performance of middle management in government authorities in the Sultanate of Oman.

Results showed the study of emotional intelligence and job performance, and the relationship between them in the middle management of government authorities in the Sultanate of Oman, which has already analyzed the following:

1- Item reliability was found higher in both the scales.

2- The descriptive statistics were also reported and discussed. It was found that the middle level employees scored high in both the phenomena, i.e EI & Job Performance. They have high emotional intelligence and also have high perceived job performance.

3- Correlation between EI and JP was calculated and reported. It was found that the phenomena EI of the middle level employees were very weakly and not significantly associated with Job Performance.

4- The impact of emotional intelligence on job performance was ascertained through linear regression analysis. Study reported a negative relationship between emotional intelligence and job performance among middle management staff in government authorities in the Sultanate of Oman.

5. SCOPE FOR FUTURE RESEARCH

1- Conduct a study to assess the reality of the emotional intelligence of the various segments of employees in the public and private sector in the Sultanate of Oman.

2- The similar studies can be conducted in different industry by adding more relevant independent variables with increased sample size.

REFERENCE


WHAT IS A DIGITAL ENTREPRENEURSHIP ECOSYSTEM: PLAYERS AND PROCESSES

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ABSTRACT

A key factor determining the success of a Digital Startup has been the Ecosystem that it is located in. Startups cannot succeed in isolation and need an enabling environment and the support of a large number of Ecosystem Players. This is the reason that a large number of Digital Startups have been attracted to successful ecosystems like London or Berlin. This paper analysis the key constituents of a successful Digital Ecosystem and identifies the relationships between the key players of an ecosystem. The Entrepreneurial Ecosystem consists of seven key pillars: Proximity to Accessible Markets, Availability of Human Resource, Funding Opportunities, Support Systems, Government and regulatory framework, Education and training, and Cultural Support. Availability of human resource and Educational and training opportunities is linked to presence of Universities which form a key actor in the Ecosystem. Also large Ecosystems tend to draw a large number of immigrant skilled labour thus contributing to the easy availability of workforce. Angel Investors as well as Venture Capital Firms are important actors as far as funding opportunities are concerned. Also extremely important has been the Support Systems that can help a fledgling startup gain experience and valuable feedback. Business Accelerators and Incubators are key Support Systems which not only help support through mentorship programmes but also help startups find economical work space and connections to other actors. In this paper, the role and relevance of all these actors and a discussion about the changing nature of Digital Ecosystems are presented. The paper also discusses development process and growth of a Digital Ecosystem, and the case study of the European ecosystem is analysed.

Keywords: Entrepreneurship, Digital, Ecosystem, Startups

1. INTRODUCTION

Digital technologies have become a major part of our lives. Its proliferation over the last 20 years has been outstanding and unique. They currently have a very important part to play in the world’s economy and have revolutionized several aspects of our daily lives. Digital technologies have also contributed to a new way of living and connecting to people through innovative social networks and endeavours [1]. Many traditional businesses have also changed due to the digital revolution and adapted to the current trends, adjusting their business models, customer relations and other aspects of their many practices, such as healthcare, manufacturing, banking and many others. It is undeniable that technology is shaping our world and the young people need to be able to shape the digital technology for a continued development.

Europe has to continue the route of innovation that has been following, especially since the implementation of the program Horizon 2020, and to help the young entrepreneurs solidify and develop their ideas into successful and scalable businesses [2]. While there has been a tremendous growth in Web Entrepreneurship over the last decade with the potential of digital business models being proven, there are still many challenges, such as financial, technical-related challenges and management-related challenges. The lack of opportunities cannot be a reason for young entrepreneurs to fail; they need solid and nurturing ecosystems to assist them in the difficult and sometimes daunting task of starting a digital business [3].

There are, indeed a variety of options that young entrepreneurs have at their disposal to advance their ideas and businesses such as accelerators, incubators, business angels and much more, but the accessibility to one or more of these actors is not as easy as it would be expected and, more importantly, needed [4]. The proliferation of entities and programs to support young entrepreneurs has been rising fast but, as it has been observed in recent years, not sustainably because some actors and programs are launched without an exact and concise focus, goal and purpose. Succinctly, some programs are not finding their space in today’s ecosystems [5].

This paper describes the players and processes in digital entrepreneurship ecosystem. In this regard, next section is explaining who are the actors, what they do and how they contribute to the ecosystem, and provides a brief explanation and introduces a study to be developed on how some actors view other actors, how they think the ecosystem should be developed and how the actors should interact with each other. This paper also presents the discussion about the changing nature of Digital Ecosystems. Moreover, different stages of development process of a Digital Ecosystem are discussed. Finally, the case study of the European ecosystem is analysed.

International Conclave on Innovations in Engineering & Management
(ICIEM-16, pp. 298-307)
2. **STARTUP ECOSYSTEMS AND THE ROLE OF ACTORS**

Startup ecosystem is defined as a set of people, startups in various stages, and several types of organizations such as universities, funding organizations, support organizations, corporations, research organizations and others, in a location, interacting as a system to support the creation and development of new startup companies [6]. The startup ecosystems have a critical role in the startups themselves and, direct and indirectly in the local and global economy. Recent research has shown that the potential that startups have in creating jobs is vital for the economy in the U.S.A., and this also reflects and it’s true for Europe [7]. The startup ecosystems are vital because of the connections they enable. Startup ecosystems are composed by many actors that relate and interact with each other [8].

**Entrepreneurs**: People who take initiative by creating and organizing a venture to exploit the opportunity found who decide what, how and how much a product or service to commercialize [9].

![Diagram of startup ecosystem](image)

**Figure 1 - Actors in a Startup Ecosystem**

**Support Organizations and Individuals**: Within these organizations there are several programs and entities designed to support the startups in different stages of development, with different goals and different needs. It would be nearly impossible to state, define are explain the role of each support organization, however, the most prominent support organizations and individuals are explained in this report, which accounts for a large percentage of the offerings:

**a) Incubators**: Incubators are known to be a way of supporting startups by providing services such as management training, but more precisely, by providing a space to work [10]. A major boom in the spread of incubators occurred in the early 1990’s, mainly supporting early ventures through physical resources. However, incubators have been criticized due to the lack of exit opportunities and the need for long-term public funding for them to be sustainable. Some recent incubators have made an effort to change their way of acting and even their business model to adapt to the current trends, where for example, some incubators are now offering equity finance.

The incubators have several objectives; the first one is to sell proprietary services to the enrolled startups and to make a profit, since the incubators are also a business that needs to be sustainable. Job creation and capitalization of investment opportunities are also crucial objectives for any incubator since it’s their purpose. Through a selection process that varies in rigor and criteria from incubator to incubator, the incubators accept startups to which they sell temporary office space either for rent or for equity in the startup or for a percentage of earnings, along with mentoring and networking activities among entrepreneurs and sometimes with other organizations, to add value to the startups so they can develop into successful companies, and provide return, either monetary or in reputation for the incubators. Other objectives that an incubator might have are the complementation of already existing programs of facilities, or even institutions such as universities, to develop the community in which they are inserted and to create good will between the institution and their members and sponsors (if applicable) and the local community.

The sustainability of incubators can be a definite concern since in the 1990’s, the incubators focused on digital startups and technology-based business. After the dot-com boom, many incubators could not survive because they
weren’t flexible, most of them were too specialized and could not adapt to the new reality. What it is currently being seen in today’s incubators is the exact same.

b) Coworking Spaces: Coworking space is exactly the name itself, it is a physical space provided by an entity, be it for profit or non-profit, shared by individuals to work independently or collaboratively. Some coworking spaces provide individuals and startups with space, equipment and services that they can use at will, which otherwise they could not afford. Typical offerings are 24/7 access, Wi-Fi, printers, shared kitchens, bathrooms and lounges, seminars and guest-speakers.

These spaces have become extremely popular worldwide, with the advantage of instant networking with other startups and their founders. These spaces also provide a sense of community where young entrepreneurs can receive feedback from their peers. Otherwise, opportunities like this would be very difficult to come in traditional offices. The main source of revenue from this business is the rent paid by the entrepreneurs. However, this is not the only source of revenue that coworking spaces are able to generate, these businesses can generate extra revenues from the implementation of a monthly fee, or a membership with a reserved space or even through catering and events.

c) Accelerators: Accelerators [8] had their start in 2005 when Y-Combinator was launched in Cambridge, Massachusetts. This program invested in a small number of startups, among them was Reddit, and using the lean startup approach, it worked intensely for a short period of time with those startups to get them ready for pitching to an invite-only audience of venture capitalists. Accelerators are then, fixed-term, cohort-based programs that mentor startups and prepared them for a public pitch event. Initially these types of programs were mainly focused on digital and technology-based startups, and while this is still true, the focus has been broadening to other areas in recent years.

Almost immediately after the creation of the Y-Combinator, the proliferation of these programs started and several accelerators were launched all over the world, following the model implemented by the Y-Combinator. These programs have been extremely successful, and several large companies have graduated, as it is said of those who finish these programs, such as Dropbox and AirBnB, both graduates of Y-Combinator. However there is a very significant number of startups that struggle to find follow-on funding and eventually died. Due to the proliferation of accelerators throughout the world, now many programs are struggling to stay afloat, with some authors calling the time we live an “accelerator bubble” that is about to blow. Many programs were created without a firm belief of their value proposition and couldn’t find opportunities, startups with growth potential, quality mentors to help the startups that enrolled in the programs and the interest of venture capital for the demo-day where the startups would pitch their businesses.

Several acceleration programs are considered to be excellent and comprehensive, where the programs are divided into three groups:

- Venture-backed accelerators
- Government-backed accelerators
- Corporate-sponsored accelerators

The accelerators can have a more narrow focus and concentrate on a section of the potential market, for example the Female Propeller for High Fliers in Dublin is a gender-specific accelerator, while EyeFocus Accelerator in Berlin is exclusively dedicated to eye care. There are advantages and disadvantages in focusing the activity and the type of accepted startups in the accelerators, such as more in-depth treatment and more experts mentoring for the startups, but on the other hand, if the specific target focus suffers a disturbance (a market disturbance) then those accelerators may struggle to continue supporting startups.

Accelerators provide major benefits for not only startups but also for venture capitalists who take advantage of the filtering system that the accelerators provide from their own selection process, and thus only the best startups pitch to the investors, the chance for them to network with entrepreneurs, the people responsible for the accelerators and even other venture capital companies, and they get a glimpse of what the future of digital and technology will be to make more informed decision on their investments. For a company, the specific accelerators developed to tackle their own existing problems can be a source competitive advantage in their respective market, although the cost of creating such an accelerator with all the risk involved has to be weighed against the potential benefit. These companies also get the benefit from the scouting process to attract young and solid talent for new employees. They also get the image benefits of being associated with the support of young entrepreneurs and new businesses in the cutting-edge of technology. And for the governments, the reward is the development of the local communities, the development of the local and sometimes national economy and the creation of good will among the people.
d) Venture Capitalists: The role of venture capitalists is very straightforward in the startup ecosystems. As it was discussed in the previous paragraph, the venture capital is very much connected to the accelerators. It is fair to say that the surge of accelerators has made the search for investment opportunities by the venture capitalists much easier, because now they are invited to assist to the pitches that the startups make when they graduate from the program. The venture capitalists can now focus much better on their expertise, and for example if a venture capitalist’s focus is on mobile startups, then he can connect with accelerators that specialize in that area and watch the pitches of their graduating class and study investment opportunities from those startups. It is from the amount of investment made by the venture capitalists (and business angels) that the accelerators develop their statistics to state in how much their graduating startups were funded. One can, succinctly differentiate between two types of ventures capitalists, where the first type is the one who only funds the startup and does not provide any expertise or mentoring, and the other type who besides funding the startup, also provides mentoring and assistance in areas that the startup needs. The venture capitalists in return of their investment in the startups, receive equity. Venture capitalists get return on their investment by an IPO or trade sale of the company, or by receiving the profits from the company, all of this due to the equity that they initially take.

e) Business Angels: These actors are, most of the times individuals that fund early stage startups. Within the ecosystem they play a crucial role because they have a talent to spot early stage startups with great potential to achieve commercial success and give them initial funding in exchange for equity. Business angels also play an important role of mentorship, training and are often close and familiarized with the business.

Business angels often approach certain young entrepreneurs because they built a business in some ways similar to the ones they are trying to develop now, and thus the business angels are able to share their experiences, obstacles and give critical information that can prove to be extremely valuable down the road.

The network that business angels are able to develop cannot be ignored either. They usually have an established network and can get the necessary people in touch with the young entrepreneurs to help them in the areas they most need. An investment by a business angel lends immediate credibility to the startup and can play a vital role in gathering the first clients.

f) Courses: Within the startup ecosystems many actors and programs such as universities and accelerators, often provide courses in entrepreneurship [11]. These are time-limited and with a limited number of startups enrolled and have as the main goal to provide startups with knowledge that they currently lack. These courses can be focused on technical aspects of businesses as well as management aspects. Some courses help the young entrepreneurs to prepare for their journey to build a startup and others focused on a very important aspect that is the pitch. Hopefully, for most startups there will come a time when they need to pitch their business to investors to get funded, mentoring and the necessary resources to take their business further to the next level, and these courses offer special training to prepare the entrepreneurs to make a good impression and the best pitch possible to investors. Also, many universities offer entrepreneurship courses to give their students glimpse of that world, to provide the students with the necessary skills to start their journey, and to get them excited and prepared if one day they choose to follow the entrepreneurial route. Most courses usually get their revenues from sponsorship, and in some cases a fee is charged or the courses are taught and developed resorting to public funds.

g) Competitions: Many actors often create and develop competitions between startups and individuals such as students, with prizes for the best competitors in order to achieve a wide variety of goals. Within these goals, a large company, for example may start a competition to solve one problem they currently have and the solution proposed by the people who enter the competition might turn into a startup. Competitions promoted by large companies usually end up with the company owning equity in the startups. These competitions are also time-fixed with the value gained from these programs being the organizational efficiency, sense of urgency and building of a community among the competitors with an important aspect of peer-to-peer learning. Many competitions have judges panels comprised of business angels and other investors who can view potential on the work developed by the competitors and many doors can open for the young entrepreneurs. Universities started a type of competition, the business creation competition, in order to get the students interested and engaged in entrepreneurship. These competitions can offer a glimpse of the future in digital world, spot early potential that the winners show, and they even serve as a means of selection process for different entrepreneurship programs. Most competitions generate revenue through sponsorship, charging of a fee or from public funding.

h) Others: Just as Nesta [12] suggests, there are a wide variety of programs and models within the startup ecosystems that aim to help the young entrepreneurs. In recent times, due to the surge of a great panoply of programs, many of these are struggling to become or stay sustainable. Examples of these models are presented in Table 1.

Educational Institutions: These institutions, especially universities, are a melting pot of ideas, and there is indubitably, no place better to find a large pool of diverse (nationality, background, values and priorities) young people with great potential to create startups.
Table 1 - Other models/programs in the startup ecosystems, Adapted from Nesta (2011)

<table>
<thead>
<tr>
<th>Model/Program</th>
<th>Definition and Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Startup Weekends</td>
<td>The program spans across one weekend, attracting young entrepreneurs, coaches, mentors sponsors and others and focuses on building new business with innovative ideas, with a presentation at the end of the weekend.</td>
</tr>
<tr>
<td>Investment Marketplace</td>
<td>It tries to open up the process of raising angel investment by putting up business angles’ record so that young entrepreneurs have access to them.</td>
</tr>
<tr>
<td>Startup Schools</td>
<td>Some of these programs describe themselves as pre-accelerator programs. They train and mentor startups and prepare them from acceleration.</td>
</tr>
<tr>
<td>Meetups</td>
<td>This model makes it much easier to find similar people in the startup community, to discuss ideas and receive feedback from peers.</td>
</tr>
<tr>
<td>Hackathon/days</td>
<td>This program focuses on creating new tools within a time-fixed frame, and not with connecting people like the Meetups model. They aren’t also focused on building new business such as Startup weekends.</td>
</tr>
</tbody>
</table>

Universities also possess a vast panoply of vital resources, such as infrastructures, mentoring and support, that the young entrepreneurs can take advantage of to pursue their ideas and turn them into a startup. There are actually a number of programs that take place within the universities. The universities’ Alumni network can also play a crucial role, since can have the necessary connections to help the young entrepreneurs get in touch with the entities that they need to pursue their goals and the Alumni themselves can actually support the young entrepreneurs because of an attachment they have with the educational institution. The universities also allow a sneak peak into the future, because most conducted research and innovation takes place within university’s walls and by university’s professionals that pass their knowledge to the younger generation that can seize that opportunity to create a cutting edge digital venture.

**Government:** The governments can have a crucial role to play in their respective startup ecosystems. First of all they can create and promote a culture of entrepreneurship to bolster public awareness and the confidence that sometimes lack in the young entrepreneurs to take a step forward and advance their ideas. By shaping the country’s culture where initiative and success are celebrated, a government can create a healthy environment to nurture startups that will help the local economy and even improve social aspects. The governments can create infrastructures and “innovation hubs” to attract early-stage digital startups. This will provide networking opportunities as well as a healthy environment and a sense of community between the startups, the young entrepreneurs and their workers.

The governments can also facilitate and even promote the early engagement of the private sector, so that successful and specialized companies can support the ecosystems and their startups, mentoring them, providing the ecosystems with all the necessary tools so startups have all the means to develop and scale up in a sustainable way. Governments should be very attentive to the conditions that their locals have and just try to imitate what’s been done in Silicon Valley for example. The local conditions (environmental, financial, market, infrastructures) will determine how to shape the ecosystem and how it can grow.

**Large Companies:** This actor is capable of playing very different roles within the ecosystems. They can, as is very often the case, sponsor a program, for example an accelerator program within their area of expertise. They can provide funding to selected startups that they feel have the potential to become a successful company themselves. The large companies can provide other resources to the startups such as people to help the startups at crucial times, they can provide mentoring from executives of the company or from specialized people that don’t necessarily work in that company, and they can even help the startups to penetrate their markets by helping them develop a pilot program to observe the market response.

**Service Providers:** These organizations are extremely important for the ecosystem and startups. They provide several services for startups at a very affordable cost or, in many cases even for free. Among the services provided are the legal and financial services, consulting services, accounting services and any other service that the startups are in need and don’t currently have the means to solve the need. These organizations are usually paid by other entities with an active role in the ecosystem such as the government, the large companies that sponsor a part or the program entirely or even in some cases the city where the ecosystem is located.

These actors constantly interact with each other within the ecosystem with the goal of supporting the startups and also to be successful themselves. A brief and simple schematic of how these actors interact with each other is provided in Figure 2.
There is a usual or common path for young entrepreneurs to create and develop a startup and that is to attend educational institutions where they can receive the basic knowledge and skills in order to create a business endeavor, to manage it successfully and to scale it appropriately. There are however rare occasions where the attendance of these institutions doesn’t realize but the young entrepreneurs, for sheer force of will and talent are capable of creating a successful startup. Once the young entrepreneurs create a startup, they usually resort to support organizations and individuals in order to obtain mentoring and funding to accelerate, scale and develop their startup into a sustainable successful business which in the future can be acquired by a large company, or can grow into a market leader. The service provides have an important role to play in the startup ecosystems and have a direct impact in some actors within the ecosystem. They provide services to large companies that have interests in the ecosystems, such as consulting services for companies who are building one. They can provide legal services to help governments develop public policies. The service provider can also have a direct influence on the startups themselves through consulting or legal services to ensure the legal situation of the startups and sometimes to provide mentoring by making available some experienced entrepreneurs or executives from relevant companies. Finally, these providers relate directly with some support institutions such as accelerators or incubators, by providing a wide span of services to improve their performance so they can more freely and better support the startups in them enrolled. The governments have a crucial part to play and relate very closely with several actors in most ecosystems, such as the large companies, where the government can provide funds or incentives for them to invest, to be interested and to get interest parties in the startups. The governments, in many cases, provide incentives and means for young people to become interested and to create a business that will improve the local economy. The governments fund the public educational institutions that will provide the knowledge and skills the young entrepreneurs need to advance their ideas. Finally, the governments usually provide support to organizations such as accelerators or incubators, while sometimes it is actually the governments who create and develop support organizations to help develop startups with heavy social and local economic impact.

The support organizations and individuals in addition to relating to other actors like it was mention, they also participate in a great step that is the acquisition. This acquisition might be only a small or large percentage of the startups’ equity to help them develop and take a step forward and it can also be the support to an acquisition by another entity or even support for an IPO. Finally, the large companies have a direct influence on all actors of the ecosystems. The influences range from working with the governments on public policies and even supporting the startups in social ecosystems through mentorship, to the actual buying of startups. One very interesting aspect that has received no attention at all in the literature is the perception that each entity within the support organizations and individuals has of each other and their respective role. From the point of view of each entity, the value that the others are adding can seem somewhat different and some improvements can be made in order for the ecosystem to be developed in a more efficient way with the final goal of supporting in the most efficient and effective manner the startups. For example, it is known that the accelerators do indeed make the job of searching for mature enough and excellent startups by the venture capitalist easier, however, the fact that the venture capitalists have to go through many accelerators and listen to pitches by innumerable startups, makes some of them less interested. This decline in interested is also caused by the different areas of expertise of some of the startups that are pitching, and some startups are just not up to the standards of the venture capitalists. This makes the process exhausting and inefficient for the venture capitalists, since they only want to really observe the pitches from startups in lines of business consistent with theirs and startups that are in a development stage that is appropriate for the venture capitalists to invest in. Thus, it is proposed a study, based on interviews and questionnaires to many support organizations and individuals (since there is almost none information already available, because of the complete lack of attention this issue has received) to assess their perception of each other,
to proposed changes to the ecosystem and how these entities relate to each other in order to improve the process of developing successful startups.

3. NATURE OF DIGITAL ECOSYSTEMS

Startup ecosystems are very dynamic entities; they are controlled by external and internal factors. Within the external factors that influence the startup ecosystems, there is the financial climate, and market and big companies disruption and transition. Much like a traditional company, startup ecosystems go through a maturing process and they can suffer from external disturbances such as financial bubbles, from which they have to recover. Within the internal factors, the problem of the amount of available resources can be highlighted such as people and organizations with the capability of contributing for the ecosystem. One other internal factor is the actual success or failure rate of the startups within the ecosystem that can influence, either positively or negatively the future and health of the ecosystem.

Due to the changing financial climate that periodically occurs, the startup ecosystems need to be extremely dynamic for when a disturbance occurs, they can move away from their initial state, adapt and recover in a sustainable form from that disturbance. Many ecosystems fail due to this reason, they are too resistant to change and when a disturbance occurs they don’t put into action the proper contingency plans and fail to adapt to the new market situation and demand. Also, year after year, startup ecosystems suffer changes in people, such as entrepreneurs and mentors, they suffer changes in the support organizations available, changes due to the financial and market climate, and thus a flexibility, willingness and capability to adapt can make the difference between a successful and sustainable ecosystem that nurtures, supports and helps create and develop successful startups and ecosystems that fail in their goals with grave repercussions for all entities, namely the startups that exist in those locations that were counting on their support. However, these disturbances discussed are not all bad and can actually provide important opportunities. Through these disturbances, new startups with extremely innovative ideas and business models can arise and the ecosystem, if properly prepared, can assist in sprouting a next generation of brand new startups already adapted to a new reality and with an increased resistance to financial and market fluctuations. The digital and technological-based startups are changing the world and the global economy through creativity, innovation and perseverance, and the ecosystems that effective and positively support these endeavors are now more crucial than ever before.

4. DEVELOPMENT PROCESS OF DIGITAL ECOSYSTEM

The idea of startup ecosystem is not new, because some ecosystems have been in existence for quite some time, twenty years in some cases, such as Silicon Valley and Boston for example. However, today, digital and technology entrepreneurship is a global phenomenon with ecosystems emerging in every corner of the world. And what happened years ago with almost every tech and digital startup being created exclusively in those ecosystems, is no longer true. We have been experiencing an explosion in the rise of new startup ecosystems while others reach a maturity level, primarily because of the global explosion of entrepreneurship, namely digital entrepreneurship. But although we are experiencing a major growth in this area, many authors have recently stated that this growth rhythm is unsustainable and to prove this view, there are already some ecosystems struggling to stay afloat. The future of the global economy and the rise of the information economy have also been fueled by the growth of digital and technology related startups, and thus it is crucial to keep supporting these startups and to improve the aid, guidance and cooperation within and from the ecosystems to ensure a brighter future for both the startups and the global economy.

A clear flow of different stages from the idea to a company maturity is crucial for any startup. Knowing in which stage the startups stand in their development process or lifecycle is very important so they can assess their progress. These stages are also useful to describe the financial stages of startup, which some authors delve into. However, these stages do not provide any information on which aspects should be improved in order for the startups to develop further sustainable growth. Some authors have come forward with their own framework to what they believe are the different stages that every startup needs to go through in order to achieve maturity. Most authors, and the most prominent ones, don’t deviate much from each other, proposing frameworks that only slightly differ from each other’s. The proposed frameworks that are compared with each other are the Mariner Stages [13][14], the one proposed by Steve Blank in his book Four Steps to an Epiphany [15], the framework proposed by the Startup Professionals, Inc.[16][17], and the one proposed by Meng Wong’s Map of the Money [18][14]. This last author discusses the several stages of startup development through the funding rounds a startup gets. Table 3 provides an overview and compares the views of the authors with each other’s in a simple and clear manner. The first proposed stage, Seed/Angel round does indeed coincide with the other three frameworks, but the second stage, Early stage, lasts longer when compared to the other views, it spans across the second and third stages as depicted by the other authors. The last two stages of the framework proposed by Meng Wong, Series A Round and Beyond/Growth and Late stage, both coincide with fourth stage of the remaining models.
It is clear to observe that the Marmer stages are product centric while the stages proposed by Steve Blank are company centric, and additionally, the stages proposed by Startup Professionals, Inc. are in some ways a mix of product and company centric, making that distinction somewhat confusing and the whole model somewhat difficult to understand, yet not as complex as the Marmer stages and the stages brought forward by Steve Blank. The Marmer stages provide two more stages when compared to the other frameworks, Profit Maximization and Renewal/Decline. This means that this framework provides all the steps from the beginning and conceptualization of the idea and value proposition, up until the company becomes a market leader or is acquired by another entity, a larger company for example, or up until the decline of the company, whereas the other frameworks end in the growth stage and the actual building of the company. The Startup Genome[19][20][21] also depicts the recommended round size at each proposed stage. It is imperative for the round size at a certain stage to be larger than the round size at the previous stage, meaning that in a plot, there cannot be any negative slopes in order for the startup to be sustainable.

The report recommends the following round size:

- Stage 1: 10 – 50k dollars.
- Stage 2: 100k – 1.5M dollars.
- Stage 3: 0 (it is recommended to wait until stage 4 until raising more funds).
- Stage 4: 1.5 – 7M dollars.

### Table 2 - Framework comparison of startup development stages

<table>
<thead>
<tr>
<th>Marmer</th>
<th>Steve Blank</th>
<th>Startup Professionals, Inc.</th>
<th>Meng Wong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery (5-7 months)</td>
<td>Customer Discovery</td>
<td>Idea</td>
<td>Seed/Angel Round</td>
</tr>
<tr>
<td>Find out if product is solving a meaningful problem</td>
<td>Validate the problem, product and customer hypotheses in the business plan</td>
<td>Validate idea and prove that it solves a true problem.</td>
<td>Raise enough capital to build the first version of the product and raise the next round of capital.</td>
</tr>
<tr>
<td>Validation (3-5 months)</td>
<td>Customer Validation</td>
<td>Startup</td>
<td>Early</td>
</tr>
<tr>
<td>Get an early validation:</td>
<td>Build a repeatable sales road map:</td>
<td>Build a legal entity with product development and real customers:</td>
<td>Show traction and begin to generate revenue:</td>
</tr>
<tr>
<td>-Refinement of core features</td>
<td>-Prepare the sales road map and marketing strategies</td>
<td>-Implement different management style</td>
<td>-Build a commercialized version of the product</td>
</tr>
<tr>
<td>-Initial user growth</td>
<td>-Develop a positioning statement</td>
<td>-Finalize business plan</td>
<td>-Develop core features</td>
</tr>
<tr>
<td>-Metrics and analytics implementation</td>
<td>-Find a group of</td>
<td>-Search and file patents</td>
<td>-Build a customer base</td>
</tr>
<tr>
<td>-Seed funding</td>
<td></td>
<td>-Funding from friends and</td>
<td>-Hire first employees</td>
</tr>
<tr>
<td>-First key hires</td>
<td></td>
<td>family.</td>
<td>-Formulate an exit strategy</td>
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<tr>
<td>-Pivots (if necessary)</td>
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<tr>
<td>-First paying customers</td>
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<td></td>
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<tr>
<td>-Product market fit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency (5-6 months)</td>
<td>Customer Creation</td>
<td>Funding</td>
<td>Series A Round and Beyond/Growth</td>
</tr>
<tr>
<td>-Value proposition refined:</td>
<td>-Create end-user demand</td>
<td>-Make the preliminary product available</td>
<td>-Massive marketing spending</td>
</tr>
<tr>
<td>-User experienced overhauled Conversion funnel optimized</td>
<td>-Drive that demand into the startup’s sales channels</td>
<td>-Generate enough revenue to validate the business model</td>
<td>-Infrastructure construction</td>
</tr>
<tr>
<td>-Viral growth achieved</td>
<td>-Heavy marketing spending.</td>
<td>-Pitch the startup to Angel investors.</td>
<td>-First executive hires.</td>
</tr>
<tr>
<td>-Repeatable sales process and/or scalable customer acquisition channels found.</td>
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</tr>
<tr>
<td>Scale (7-9 months)</td>
<td>Company Building</td>
<td>Growth</td>
<td>Late</td>
</tr>
<tr>
<td>-Large A round</td>
<td>-Transition from informal</td>
<td>-Validate a large market opportunity</td>
<td>Exit/IPO</td>
</tr>
<tr>
<td>-Massive customer acquisition</td>
<td>-Learning teams to full departments with directors</td>
<td>-Revenue of $5+ million</td>
<td></td>
</tr>
<tr>
<td>-Back-end scalability improvements</td>
<td>-Focus on building mission-oriented departments.</td>
<td>-Ready to scale to be a market leader</td>
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<tr>
<td>-First executive hires</td>
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<td>-Seek venture capital funding</td>
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<tr>
<td>-Process implementation</td>
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<tr>
<td>-Establishment of departments.</td>
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<td></td>
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<tr>
<td>Profit Maximization</td>
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</tr>
<tr>
<td>-Continued customer acquisition</td>
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<td></td>
<td></td>
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<tr>
<td>-Massive funding rounds</td>
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<td></td>
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<tr>
<td>-Expansion of production and operations.</td>
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</table>
5. CASE STUDY: THE EUROPEAN ECOSYSTEM

The European startup ecosystem is evolving at a rapid pace in recent years but it is still not at the level of the startup ecosystem in the U.S.A., and understandably so, since they have been experiencing several waves of innovation since as early as the 1930’s, while Europe started somewhat later. Even just a few years ago European startups, namely digital and technology-related startups, would rather choose to go to the U.S.A. to develop their ideas, since they did not think that they could have the same level of support and quality mentoring in Europe that they could have in America. However, this trend has changed in recent years and much credit goes to the several quality and world-renown ecosystems that are spread throughout Europe and Israel (in this paper the startup ecosystem in Israel is considered an European one), and to the venture capital industry and business angels that are seeing the creativity and potential that the young European entrepreneurs have, and are providing the much important seed capital and mentorship.

According to the Global Startup Ecosystem Ranking\(^1\) (2015) and Nesta [17] Europe has three ecosystems in the top 10:

- Tel Aviv, which is the ranked 5\(^{th}\) and is down from 2\(^{nd}\) from 2013. This is the ecosystem that has the highest density of startups in the world. It is highly dependent, and on the other hand highly specialized, in tech-driven startups. Although the report warns that it is behind Silicon Valley in the tech scene, Tel Aviv is able to attract entrepreneurs from a wide variety of countries and continents.

- London, which is the ranked 6\(^{th}\) and is up from 7\(^{th}\) from 2013. London it the top ranked E.U. ecosystem and it takes advantage of its prime location. While London is the most successful startup ecosystem in E.U., as of 2013, it was only producing an output 63% lower than Silicon Valley.

- Berlin, which is ranked 9\(^{th}\) and is up from 15\(^{th}\) from 2013. Since 2013 Berlin was able to surpass two great European ecosystems: Paris and Moscow. Berlin has a lot going for it, starting with its geographical location where the access to Russian and Eastern Europe markets is much easier than the London and Paris ecosystems and it has a typical and very vibrant startup environment. In recent years, the amount of funding, mentorship and substance that Berlin offers startups has increased in a rapid pace which contributes heavily to its climb in the ranking.

There are other major ecosystems in Europe, but not in the top 10 of this ranking. Paris is currently ranked 11\(^{th}\) which is the same ranking it had two years ago and Moscow is ranked at 13\(^{th}\), a climb of one place compared to the ranking of 2013. There is a European ecosystem that cracked the top 20 of this ranking: Amsterdam. This is, currently, a highly sought after ecosystem, namely for digital startups. Its great advantage is its location and market reach.

The development of digital startups can be a very helpful element to grow a country’s economy. Some European countries, such as Portugal, Spain and Greece, are taking that observation into account and are actively searching to improve their ecosystem to support their own startups as a means to grow and to make them known to the innovation world.

Recently, there are some published reports [17][22][23] representing the growth of startup ecosystem in Portugal, stating that Portugal has discovered its spirit of entrepreneurial adventure, and the involvement of the Portuguese government in supporting the creation and development of startups. While many people are observing very closing the boom of the startup scene in Berlin and its exponential growth, in Portugal the entrepreneurial spirit is very much alive, growing at a rapid pace, accompanied by the creation and development of several programs to support these endeavors and with the activities and assistance that most Portuguese universities offer, this ecosystem shows a great potential to become one of the most prominent European startup ecosystems.

\(^1\) http://startup-ecosystem.compass.co/ser2015/
In Europe there are several prominent accelerators, for example the Seedcamp which is based in London from which many successful startups have graduated and posterior sold to large companies, such as Crashpadder which was bought by AirBnB. Another example of a successful European accelerator is the startupbootcamp based in Denmark. Its graduates have raised an average of €600,839 per startup, with a 73% funding rate.

6. CONCLUSION

This paper provides an overview of the various actors in a digital business ecosystem that are vital for the growth and development of startups. It discusses the complementarity between these actors and how they work with startups at various stages of development. The paper also describes the various stages of a startup. Finally this paper discusses the growth of the startup ecosystem in Europe.

REFERENCES

AN EMPIRICAL STUDY OF KEY PARAMETERS THAT IMPACT PURCHASE DECISIONS OF CONSUMERS WHO USE E-COMMERCE WEBSITES FOR ONLINE SHOPPING IN INDIA

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ABSTRACT

Electronic Commerce or Commerce through Internet has experienced a rapid growth all over the world during the last few years. It is a new modern-day business technique by which businesses and consumers buy and sell goods and services through an electronic media. It has not only helped in increasing the speed of service delivery but also helped in reducing the cost factors also. E.C addresses all the issues from the view-points of all the stake-holders i.e. organizations, merchants and consumers in a very efficient manner. This mode of commerce is destined to be the future of shopping in the entire universe as the leading e-commerce companies like Snapdeal, Alibaba, Jabong, Flipkart, Amazon, Ebay etc. are paving their way towards the growth and development of this concept. Most of the companies have now started running their on-line portals for also selling their branded products and specialized services through internet. As per Internet and Mobile Association of India, the domestic digital commerce market is expected to register a much higher growth in the coming years because of better internet penetration, increase in trust level and pricing advantage. As such, it has become very important for all the stake-holders to know more and more about the e-attitude of the consumers and triggered an idea of conducting an extensive study on e-commerce shopping in India.

This study investigated the preference of buyers to gather information through internet in comparison to the information provided by the branded companies. This study have observed that the present day Consumers are more efficient and expert in collecting information through internet and they believe less on the information provided by the branded companies before taking a final decision on purchasing the required products. Using Multiple Regression Model, Means Comparison Analysis and Demographic Details, the study gave decent business insights into the Indian online consumer’s cognitive decision behavior when choosing products using brick and mortar shops. This study concludes by observing that Consumers gain more experience through the use of internet and get the better information than just relying on the information provided by the advertising of the same by the brick and mortar companies.

Keywords: E-Commerce, Internet, Consumer Perspective, Branded Companies, Consumer Purchase Decisions

1. INTRODUCTION

E-Commerce is the process by which businesses and consumers buy and sell goods and services through an electronic media. This concept is different from the traditional method of commerce i.e. the buyers visiting the seller’s brick and mortar shops to obtain goods and services. In e-commerce, business is carried out electronically and there is no need of immediate availability of physical goods or hard-cash to carry out the business deal. E-commerce has emerged as a very powerful source of shopping across the entire globe. Its credit goes to the business strategy adopted by the world’s leading e-commerce companies such as Amazon, Ebay, Alibaba, Flipkart, Snapdeal, Jabong etc. for doing on-line business. More and more Consumers are now switching over to online shopping as these companies are offering attractive discounts along with making provisions of delivery of products on the doorsteps of the buyers.

As per the observations of Internet and Mobile Association of India, the digital commerce market is expected to register a higher growth in the next few years because of better internet penetration, increase in trust level and pricing strategy adopted by e-commerce companies. E-commerce provides a secure 24x7 shopping system, convenient delivery along with significant discount offers. Although, the trend of e-commerce has been making rounds for the last fifteen years or so, the appropriate eco-system has now started to fall in place with this business showing excellent growth of 50% during the last five years. As per a survey report, the number of users making on-line transactions in India is expected to grow from 11 Million in 2011 to 38 Million by the end of 2015, showing a tremendous increase of more than three times. According to Forrester, the e-commerce market in India is set to grow the fastest within the Asia-Pacific Region, i.e. at a compounded growth rate of over 57% between 2012 and 2016.
2. RESEARCH METHODOLOGY

This research paper has been bifurcated in four sections. Section I cover Literature Review, defining of the problem and need for study, research methodology and its objectives. Section II is based upon the secondary study of the subject and section III has been devoted to the primary research on 170 consumers chosen on the basis of convenience sampling. The suggestions, managerial implications and limitations have been presented in Section IV of this research paper.

(a) Data Collection

(i) Primary Data:
The primary data for this study has been collected from 170 Consumers/respondents from different parts of India. But after thorough analysis of the response sheets, only 158 responses were considered good for this study. We have structured a questionnaire which was pilot tested on 30 respondents to collect the first hand information. The issues were identified and preliminary framework of the study was developed after extensive review of literature and personal discussion with the consumers and the sellers. After that, the questionnaire was restructured to cover all the relevant factors thought necessary for this study.

(ii) Secondary Data:
The Secondary data has been collected from various journals, Research Papers, Study Group Reports, Newspapers, Official Web-sites, Books, and other relevant internet sources.

(b) Sample Design:
We have used the method of “Random Sampling” for collecting data from 170 respondents covered in this research.

(c) Data Analysis and Interpretation:
SPSS and MS Excel 2013 Computer Software have been used to analyze the primary data. To analyze the collected data, the following information has been used –

Dependent Variable: Consumer Buy Decision Likelihood Independent Variables: Product and Information Quality, Product Online Discounts, Product Return Ease, Product Checkout Ease, Product Multiple Bundling Options, Product Reviews, Product Visual Search and Prospective Buyer Internet Experience
Confidence Level: 95% Alpha Value: 5%

SECTION 1:

3. LITERATURE REVIEW

(Veterby & Chabert 2001) has observed that, “The Internet can make it easier for businesses to have information on their products and services available to their potential Consumers. Vijay Sai, T, & Balaji. M.S. (2009), revealed that consumers all over the world, are increasingly shifting from the crowded stores to the one-click online shopping format. Baty and Lee, (1995) concluded that in order to respond to the Consumer’s desire for central and convenient shopping experience, businesses design an efficient system to enable consumers to find easily what they need, learn more about the products and services quickly make a purchase decision Mr. Solomon, (1998) in his study, “Consumer behavior is the study of the processes involved when an individual selects, purchases, uses or disposes of products, services, ideas or experiences to satisfy needs and desires”. It is imperative to understand the consumer’s mind-set, intention and conduct in light of the on-line buying practice. The attitudes of the consumers seem to have a significant influence on their decision.

Sultan and Henrichs (2000) concluded that the consumer’s willingness to and preference for adopting the internet as shopping medium was also positively related to income, household size and innovativeness. Akerlof, (1970), observed that the information asymmetries between purchasers and sellers can result in market failure Brassington & Pehitt confirmed that the price which is a part of the marketing mix, a factor to stimulate the consumers and a competitive weapon used to communicate and negotiate. The purchasers are only willing to pay the expected value of the products offered for sale to them. Nelson (1970, 1974) made the distinction between search and experience. The quality of goods is verifiable on inspection, whereas an experience good’s quality is difficulty to judge on inspection. Therefore, only on the purchase and usage of an experience goods can its true quality can be revealed.

Kim and Park (2005) has conducted a study in U.S and observed that the positive attitudes of the consumers and their willingness to search for pre-purchase information leads to a strong likelihood that they will buy on-line. Goldsmith and Flynn (2004) suggested that the home catalog is another traditional selling channel where people can shop at home because of the varieties of products offered in the catalog. The consumers can order through the phone or by mail. It is convenient except that they are not able to touch and feel products before purchasing. Thong
et al (2006) suggested that enjoyment has a significant effect on shopping. As compared with off line shopping, online shopping can be equally enjoyable and can carry the positive effects.

**DEFINING THE PROBLEM AND NEED FOR STUDY**

As per a report published by Forrester, the E-Commerce market in India is all set to grow at a fastest rate within the Asia-Pacific region i.e. over 57% (compounded annual growth rate) between 2012 and 2016. The main reason for this shift in shopping pattern is due to the ease with which the consumers can find products through internet. The product information available on-line and the variety of choices offered by the e-commerce companies motivate the present day shoppers to switch over their preferences for shopping. In addition to this, this system provides much ease to vendors in setting up their establishments. However, with the proliferation of online retailers, the e-commerce distributors are facing more difficulties now in distinguishing their products and services from their competitors in the market. Then the consumers generally try to gather information from the advertisements of these branded companies.

The main factors in favor of e-commerce business are as under:

- Availability of increased broadband internet users in the market
- Growth of smart-phone users, necessary for online shopping
- Increase use of on-line classified sites by the buyers
- Availability of wider range of products for sale on-line
- Attractive offers of competitive prices by sellers for on-line shoppers
- Delivery of products at the door steps of the buyers
- Convenient way of shopping

Further, Ernst & Young conducted a study on the sources of information for the prospective buyers. They had observed that 69% of those surveyed conveyed that brand name plays a significant role in their decisions of shopping through internet. They concluded that marketing through established brands may be required to use internet, even though the consumers cost of information collecting appears to be quite low. There is a debate going on in the marketing world that advertising by branded companies is more helpful in the buying decisions of the shoppers or the use of internet by the modern day consumers and whether the brand names succeed in conveying the complete information in comparison to the source of own information gathered through internet. E-commerce shopping is increasing at a very fast rate, hence, a modest effort has been made to address all these relevant issues through this study.

**KEY RESEARCH OBJECTIVES**

- To find out the relationship between consumer parameters related to buying and “Consumer Buy Decision Likelihood”.
- To understand the demographics of Indian online buyers.
- To study the relationship between internet experience and reliance on brand information.
- To suggest few business strategies for e-commerce companies operating in India to take their business to the next level

**HYPOTHESIS**

Following hypothesis were framed for the study –

**Hypothesis # 1:** There is a relationship between Product and Information Quality and Consumer Buy Decision

**Hypothesis # 2:** There is a relationship between Online Discounts and Consumer Buy Decision

**Hypothesis # 3:** There is a relationship between Internet Experience and Brand Information

**Hypothesis # 4:** There is a relationship between Checkout Ease and Consumer Buy Decision

**Hypothesis # 5:** There is a relationship between Multiple Bundling Options and Consumer Buy Decision

**Hypothesis # 6:** There is a relationship between Product Reviews and Consumer Buy Decision

**Hypothesis # 7:** There is a relationship between Visual Search and Consumer Buy Decision

**Hypothesis # 8:** There is a relationship between Internet Experience and Consumer Buy Decision

**SECTION II: SECONDARY DATA:**

**4. EVOLUTION OF E-COMMERCE:**

The evolution of e-commerce can be attributed to a combination of regulatory reforms and technological innovations. Though the appearance of internet in the late 1960, has also played a very important role in the
evolution of e-commerce, but in fact the business took off with the arrival of the World Wide Web and browsers in the early 1990s. The liberalization of the telecommunication sector and innovations such as optic fibers, DSL (Digital Subscriber Line) have also helped in a big way in the process of its rapid growth. As a result, the barriers prevailing in entering and engaging in e-commerce business have fallen rapidly. A brief timeline of evolution is as follows –

- 1969: Internet/Arpanet
- 1989: WWW HTML invented at CERN (Conseil Europeen pour la Recherche Nucleaire) - European Organization for Nuclear Research
- 1991: NSF (National Science Foundation) lifts restrictions on commercial use of the Internet
- 1993: Mosaic browser invented at the University of Illinois, Urbana Champagne, is related to public
- 1994: Netscape releases Navigator browser
- 1995: Dell, Cisco, Amazon etc. began aggressively to use the Internet for commercial transactions

**DRIVING FORCES BEHIND E-COMMERCE**

- Global Consumers
- Global Products
- Global Operations
- Global Resources
- Global Collaborations

**ADVANTAGES OF E-COMMERCE BUSINESS**

- Increased Profits
- Improved Consumer Service and Loyalty
- Global Accessibility and Sales Reach
- Shorter time-to-market
- Supply Chain Integration
- Capturing Valuable Market Information from Consumers
- No Working-hour Restrictions
- Low-cost Advertising
- Low Barriers to Entries

**ADVANTAGES TO CONSUMERS**

- Reduced Prices
- Global Market Place
- 24-hour Access
- More Choices
- Quicker Delivery
- Fast Information
- Enables Participation in Virtual Auctions

**ADVANTAGES TO SOCIETY**

- It Enables people in third world countries and especially in rural areas to enjoy products and services which would otherwise not have been available to them.
- It allows more individuals to work from home, and travel less for shopping, resulting in less traffic on the roads and lower air pollution.
- It facilitates delivery of public services at a reduced cost, increases effectiveness and improves quality.
- It allows some merchandise to be sold at lower prices since the organization may not need physical space and a full inventory of goods.

**E-COMMERCE AND MARKETING STRATEGY**

The e-commerce is forcing companies to rethink the existing ways of doing the target marketing i.e. isolating and focusing on a segment of the population, relationship marketing i.e. building and sustaining a long-term relationship with existing and potential Consumers, and even event marketing i.e. setting up a virtual both where interest people can come and visit. Just consider the case of conventional direct marketers, who devote some 25 percent of their revenues to such costs and printing and postage for catalogues. The reliance on interactive marketing can cut such expenses and may even deliver better results.

Interactive marketing is accomplished in electronic markets via interactive multimedia catalogues that give the same look and feel as a shopping channel. Users find moving images more appealing than still images and listening more appealing than reading text on the screen. These are two powerful reasons why every text-based and still-picture based interactive experimental based service has never generated anywhere near the volume of retail merchandise orders that televised shopping channels have achieved. The maximum public acceptance will require that interactive catalogue services have a more entertaining visual appearance than traditional text-intensive catalogues have had. Ideally interactive shopping program should produce full-motion demonstrations of selected products, but such a practical and economical technology has yet to be developed.
SECTION III

5. DATA ANALYSIS AND RESULTS

The primary data considered good for this study was 158 respondents and analyzed using SPSS and Excel 2013. Demographics details of Indian online buyers were captured and analyzed. Moreover, Multiple Regression Model and Means Comparison Analysis were applied to test the developed hypothesis and arrive at the managerial implications and suggestions.

(a) Demographic Details –

<table>
<thead>
<tr>
<th>Consumer Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>76</td>
<td>48.1</td>
<td>48.1</td>
<td>48.1</td>
</tr>
<tr>
<td>Female</td>
<td>82</td>
<td>51.9</td>
<td>51.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>81</td>
<td>51.3</td>
<td>51.3</td>
<td>51.3</td>
</tr>
<tr>
<td>Unmarried</td>
<td>77</td>
<td>48.7</td>
<td>48.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>100.0</td>
<td>100.0</td>
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</tr>
</tbody>
</table>
B] Multiple Regression Model –

<table>
<thead>
<tr>
<th>Pearson R Co-efficient</th>
<th>Pearson R Co-efficient Square</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.840</td>
<td>.706</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The above model shows that independent variables explain 71% of the impact on the dependent variable.

C] Means Comparison Analysis –

**Consumer Likely To Buy * Product and Information Quality**

ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Between Groups</th>
<th>(Combined)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Product and Information Quality</td>
<td></td>
<td></td>
<td>.000</td>
</tr>
</tbody>
</table>

**Measures of Association**

<table>
<thead>
<tr>
<th></th>
<th>Eta</th>
<th>Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Product and Information Quality</td>
<td>.716</td>
<td>.513</td>
</tr>
</tbody>
</table>

**Consumer Likely To Buy * Online Discounts**

ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Online Discounts</td>
<td></td>
</tr>
</tbody>
</table>

**Measures of Association**

<table>
<thead>
<tr>
<th></th>
<th>Eta</th>
<th>Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Online Discounts</td>
<td>.517</td>
<td>.268</td>
</tr>
</tbody>
</table>

**Consumer Likely To Buy * Return Ease**

ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Return Ease</td>
<td></td>
</tr>
</tbody>
</table>

**Measures of Association**

<table>
<thead>
<tr>
<th></th>
<th>Eta</th>
<th>Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Return Ease</td>
<td>.409</td>
<td>.167</td>
</tr>
</tbody>
</table>

**Consumer Likely To Buy * Checkout Ease**

ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Likely To Buy * Checkout Ease</td>
<td></td>
</tr>
<tr>
<td>Measures of Association</td>
<td>Eta</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Consumer Likely To Buy * Checkout Ease</td>
<td>.387</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer Likely To Buy * Multiple Product Bundling Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of Association</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Consumer Likely To Buy * Multiple Product Bundling Options</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer Likely To Buy * Consumer Reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of Association</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Consumer Likely To Buy * Consumer Reviews</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer Likely To Buy * Visual Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of Association</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Consumer Likely To Buy * Visual Search</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer Likely To Buy * Consumer Internet Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of Association</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Consumer Likely To Buy * Consumer Internet Experience</td>
</tr>
</tbody>
</table>
The above results show that p-value for all the variables except Visual Search is less than the alpha value. Hence, these variables impact Consumer Buy Decision to a level measured by the degree of association.

6. MANAGERIAL IMPLICATIONS/CONCLUSIONS

Using Multiple Regression Model and Means Comparison Analysis, we conclude that variables Product and Information Quality, Product Online Discounts, Product Return Ease, Product Multiple Bundling Options, Product Reviews, and Prospective Buyer Internet Experience have statistically significant impact on Consumer Buy Decision Likelihood since the p-values are less than the alpha value. Moreover, R^2 (Co-efficient of determination) = 0.706, signifying that model explains majority of the impact on the Consumer Key Buy Decision Likelihood. This is clearly evident by looking at the Measures of Association table for each of the independent variable. However, Product Visual Search does not hold a statistically significant relationship with Consumer Buy Decision Likelihood since the p-value is more than the alpha value. In addition, consumers who have decent internet experience prefer branded products over non-branded products.

Using demographic details, we conclude that younger age groups and those with high incomes specifically professionals and post graduates prefer online shopping in the Indian sub-continent. These segments want quick product delivery and have less time to purchase items than to visit brick and mortar shops to fetch goods. The online shopping organizations can apply the relevant variables and factor, identified from this study for creating their strategies and tactics to increase the sale of their products. The results of this research can also be used by various organizations to identify the target Consumer segments for their products.

7. SUGGESTIONS

By incorporating the results of this empirical study, the e-commerce companies operating in India can focus on the parameters important for consumer buy decision. Moreover, the companies can target the relevant products that cater to the relevant demographic segments to increase their sales and subsequently their profits. The companies will be equipped with better business strategies to increase their market share and improve their overall brand value. The companies can host only high selling branded products, which consumers are looking for. The top and senior management teams can apply appropriate strategic and tactical goals to execute their business plans, which will position them positively in the competitive Indian online marketplace.

REFERENCES

[5] Leon G. Schiffman, Leslie Lazar Kanuk and S. Ramesh Kumar, Book on Consumer Behavior
SCHOLARLY RESEARCH AND THE NEW PUBLISHING PARADIGM

Judith Mavodza

Zayed University Library
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ABSTRACT
This paper considers what academics seek to achieve in publishing the results of their research in terms of the contribution of publications to their academic reputations, both personal and institutional, to professional practice, and to policy making. These activities are increasingly becoming intertwined with rankings of academic institutions and researchers. Current trends in publishing include traditional print and an abundance of electronic, Open Access (OA) book and journal publishing, institutional and subject-based repositories, self-publishing, and informal publishing in social media. The paradigm has an impact on traditional commercial publishers, some of whom are not comfortable with eBook publishing for academic use. The perspective also encompasses the growing volume of professional literature produced in English as well as other languages, and how that productivity affects academic standing of scholars and their parent institutions.

Keywords: Publishing paradigm, Self-publishing, Open Access, Repositories, Institutional rankings

1. ELEMENTS OF SCHOLARLY RESEARCH

Scholarly research can be defined as that which has undergone review by peers and other scholars so that it is viewed as authentic, valid, and reliable, worthy of being distributed. It can be done by a single scholar, or jointly with other scholars, and is distributed in various ways that this paper addresses. Increasingly, the impact of such research is taking on a more pronounced role in the visibility of individual researchers as well as on their parent institutions. This refers to research and researcher impact, and leads to university/college rankings. Scholars thrive on the prestige of their academic works since that opens doors for them to grants, promotion, tenure, and general recognition. While the image of the university sits well with students, grant makers, and funders if highly ranked, its status is hyped mostly in the media. The major challenge resulting from the media hype is the tendency to report without clearly explaining or elaborating what the rankings framework means. But then, the conveyed messages have the effect of placing universities in competition for attracting high caliber faculty, higher student enrollment and retention, and making them focus on institutional image. The topic of rankings is mentioned several times in this paper because educational institutions “compete for the best students worldwide, and possibly for those who can afford to study abroad, or access premium educational models and brands” (Punie & Cabrera, 2006). In this 21st Century highly competitive education environment, one cannot fault a university that aspires to become ranked highly, or to maintain a high ranking status. Several ranking methods exist for categorizing universities. The popularized ones include the Times Higher Education (THE), Quacquarelli Symonds (QS), and the Academic Ranking of World Universities (ARWU) that is also known as Shanghai Ranking. Having mentioned the competitive nature of academic institutions, it is important to understand the current publishing paradigm in terms of what it does to scholarly productivity and the academy. There are traditional publishing houses, some of whom are re-focusing their models to suit the current information and technology environment, open access (OA), and self-publishing. They are accompanied by distribution methods that are also increasingly relying on internet in all places that have connectivity.

2. TYPES OF PUBLISHING

Currently there are several types of publishing. Scholars and other authors can use the traditional publishing houses, self-publishing, open access (OA) publishing, print-on-demand publishing, electronic publishing, repositories, and social networking platforms. This paper addresses these in the context of a new publishing paradigm that is instigated by internet availability.

3. TRADITIONAL PUBLISHING HOUSES

When an author writes a paper or book chapter, or book, there are editorial teams available in publishing houses to facilitate the peer-review and curation process. Professional editing is done so that the publication reflects high quality control mechanisms in place, and that poor quality has been filtered out. The publisher then markets the product, e.g. by displaying it at book fairs, fliers, and so on. Some publishers have become conglomerates with several imprints each, e.g. Simon and Schuster, HarperCollins (under the US News Corp umbrella), Penguin Random (after a 2013 merger between Random House - a division of the German conglomerate Bertelsmann, and Penguin Group - owned by Pearson PLC), Macmillan, and Hachette. Those of major academic publishing repute include Elsevier, Sage, Inderscience, EmeraldInsight, Walter De Gruyter, Springer, Taylor & Francis, Woodhead...
Publishing, to name but a few. The academic publishers are increasingly enabling the open access (OA) publishing model in addition to their traditional practice. OA is based on the availability of internet for both distribution and reading. Some publishers expect authors to use subvention to cope with costs to ensure their stability in the industry. This is a situation where they anticipate that the author will provide a guarantee funding towards partially subsidizing a publication in book form. The author is able to do this through support from their institution, or foundation, or some such funding source (Lowry, 2012). This has been criticized for sounding like vanity publishing since the condition for the publisher to undertake responsibility is payment. However, Leo (2011) explains that:

Publishers are requesting that authors perform more of the work in preparing books for publication. This does not make these publishers vanity presses, nor does it make these works self-published works. It is one thing to request increased authorial assistance in the book production process; it is quite another to request that authors pay the cost of book production—and then some. In fact, this practice takes the form of grants or awards in many academic research institutions, but the basic requirement is that the publication goes through the peer review process as it should. It is in place because of several academic publishing challenges. According to Fox and Patterson (2015) they include competition from low-cost printing alternatives in countries where labor is not expensive, and piracy, resulting in the academic publishers raising the cost of new books accompanied by lower royalties to authors, and forcing them to downsize. As they downsize, the author needs to get assistance because scholarly publishing still has to continue. In other words, publication subvention is intended to encourage and support scholars to keep being academically active despite the circumstances of the scholarly publishing industry.

4. OPEN ACCESS (OA) BOOK AND JOURNAL PUBLISHING MODEL

In September/October 2012, collaboration between the Association of Research Libraries Scholarly Publishing and Academic Research Coalition (ARL/SPARC), the Public Library of Science (PLOS), and Open Access Scholarly Publishers Association (OASPA) resulted in the creation of a resource that helps define what OA really is. It is a guide that shows the distinction between OA and Closed Access while describing the implications of the concepts to reader rights, reuse rights, copyrights, author posting rights, automatic posting, and machine readability. This guide is a spectrum that demonstrates the varying degrees of openness applicable to scholarly publications when discussing the OA concept. Essentially, what the resource suggests is that the state of complete OA or Gold OA is when readership rights are completely free and the publication is immediately accessible upon publication. In this case, the author holds copyright with no restrictions and the author may post it to any third party repository or website. The article is full-text and journals can make copies for storage in their repositories.

On the opposite end of the spectrum is Closed Access where scholarly works are available through subscription or membership, or pay-per-view, or other fees. In this scenario, the publisher holds copyright and the author may not deposit any versions to third-party repositories or websites, and there are no re-use rights beyond the limitations and exceptions to copyright. In-between, there are variations in terms of degrees of access, ranging from closed to open and vice versa. The imagery of a spectrum where characteristics can be attributed within a continuum ranging from completely open to closed means that there is flexibility depending on the aims and licences of the originators of scholarly material and publishers. OA to scholarly material is a method of information sharing. Researchers are sometimes unsure of the models or implications of using it, but as more information becomes available, they are increasingly finding the paradigm acceptable. Initiatives such as the Emerging Open Access Policy Framework in the U.S. (2013) suggests that in the United States (US), the level of understanding of OA details is being taken seriously in line with the Berlin Declaration (2003) that proposes OA to knowledge in the sciences and humanities. The advantage of this is that the attitudes of US educators influence international practices of educators in many ways. This kind of advocacy gesture and knowledge dissemination about the OA model have the potential to cause a gradually expanding acceptance result. Addressing the same agenda from a European perspective, a Horizon 2020 document by the European Commission (2013) emphasizes the need for OA to the end-user for scholarly journals supported by research funding. In fact, in July 2015, Dutch universities were seriously considering moving towards an Elsevier boycott plan to demonstrate that journal subscriptions were supposed to be available through the Gold OA. The reason for that is the university or funding organization will have already paid the publishing costs, so putting a pay wall against access means the publications are doubly paid for. In Africa, organizations that receive funding from Electronic Information for Libraries (EIFL) and International Network for the Availability of Scientific Publications (INASP), for example, have become highly sensitized about the OA initiative. Additionally, the Southern African Universities Association (SARUA) (2008) Opening Access to Knowledge in Southern Africa document is a reflection of the early adoption of OA as a research publication and dissemination strategy. The Global Open Access Portal (2015) lists OA initiatives around the world, and is where one is able to assess the activities in individual countries, and the advances that are being made in that publishing model.
Sometimes there has been a lack of information on genuinely authentic OA journals to contribute to. Some academics and commentators are convinced that OA journals have low impact factor, but this is a discussable topic because what is important is to publish outstanding research that attracts wide readership, and containing a formidable level of detail. The fact that a journal is OA does not depreciate the quality of contributed research findings that are authentic. In any case, the OA model is still evolving so comparison with those that have been active over a long time is flawed. The Directory of Open Access Journals (DOAJ) (2015) website points out it “does not condone the use of impact factors; does not recognize partial impact factors, and advocates any official, alternative measure of use, such as article level metrics. There is only one official, universally recognized impact factor that is generated by Thomson Reuters”. The implication of this statement is that the newer OA journals and their articles will inevitably have lower impact factors. As a concept that is still being adopted means that for some time those impact factors will remain lower than the more established ones. This is a major concern for scholars, especially those in the early stages of their careers who want to be visible by publishing in well-recognized journals. A re-focus by academic evaluators and established scholars can go a long way in encouraging publishing in valid and reputable OA journals.

Knowledge and being comfortable with use and contribution to OA matters is also often dependent on discipline. For example, the health sciences are more aware of the model as confirmed by Allen and Seaman (2014), and in agriculture as suggested by Clobridge (2014). Regardless of this, many researchers still question the validity and authenticity of OA published material especially because of the abundance of lower-quality, non-peer reviewed vanity publishing that is flourishing due to the possibilities enabled by the Internet – referred to by Clobridge (2014, p. 44) as “the wild west of OA publishing” and predatory OA journals. Beall (2015) has created a website where he lists “potential, possible, or probable predatory scholarly open-access publishers”. The list is regularly updated because of the rapid developments that keep taking place online, and many academic libraries have a link to the website address http://scholarlyoa.com/publishers/.

As big publishers such as Elsevier and Springer are now offering the OA option to scholars when they are submitting their publications, the concept is becoming better understood. For example, “OA now includes several permutations based on levels of openness… Most of the large STM publishers now provide this option in order to comply with open access mandates yet still allow traditional subscription-based or pay-per-access business models to remain in place” (Clobridge,2014, p. 44). In fact, the Directory of Open Access Journals (DOAJ, 2015) website specifies to publishers that “to clearly state exactly which rights readers have when they use the material is a way of showing that you are sharing your published material to support a greater global exchange of knowledge. It is also a way of protecting your material from illegal use (for example if you are stating that you prohibit reproduction or commercial use of your articles)”.

A Nature Publishing Group (2015) research concluded that “Open Access journals can have similar impact to other journals, and prospective authors should not fear publishing in these journals merely because of their access model. Furthermore, it does not appear that expansion of potential readership in itself will necessarily transform the impact of a journal”. Even the rationale for sometimes making authors pay has become clearer, i.e. the publisher has to find a way of sustaining publishing. It is not the same as vanity publishing which indiscriminately encourages and welcomes non-scholarly articles getting published for a charge. The OA Initiative (Suber, 2007) allows for scholarly publishing to take place faster, with pre-prints available well before actual publication dates. An important topic relating to OA is the nature and viability of the model from the publishers’ perspective because its mandate may negatively affect their revenues. A Publishers’ Association press release of 1 June 2012 reflects the results of a report commissioned by The Publishers Association and the Association of Learned, Professional and Society Publishers (ALPSP) that concludes that: Higher Education Institutions’ libraries may be impacted by the collapse or scaling down of academic publishing houses. The world’s most distinguished research institutions would, … be impacted the most, since published outputs are essential for the work carried out by their researchers.

The practical solution put forward is to have a funded OA alternative, but the debate is on-going. In the United Kingdom, the Working Group on Expanding Access to Published Research (2012) produced the Finch Report which suggests that publishers, funding bodies, and representatives of the research community publishers need to continue debating with the ultimate aim of having research articles more freely accessible to everyone immediately upon publication. Sharing similar concerns, the June ACRL/ SPARC Forum (2012) discussed robust and sustainable ways of funding OA to help authors make up for or cancel out the cost of journal publication. Starting from May 2012, a multi-stakeholder Task Force initiated and supported by Confederation of Open Access Repositories (COAR), with members representing a number of different types of organizations (libraries, licensing agencies, library associations, and OA groups) with a common interest in promoting sustainable and effective practices for OA became operational. The Task Force aims to review and assess the growing number of OA agreements being implemented between publishers and research institutions. There is even a joint IFLA/Brill Publishers effort encouraging initiatives in the area of publishing monographs for OA.
While Developed World scholars and publishers deliberate about the cost-effectiveness of OA, in the Developing World, the initiatives are sometimes viewed with suspicion for any number of reasons. The author suggests that rather than taking this perspective, it is more productive to focus on ways of integrating national research, where it exists, into the global research pool so that research from the Developing World can become visible. That counters the tendency to have Western only research reports and publications as they may not necessarily always be appropriate or relevant. Christian (2008, p.15) points out that part of the OA challenge is:

The misconception and lack of awareness of the existence and benefits of open access publishing. This problem is to some extent associated with lack of internet access...Even those who have access to the internet may not necessarily be aware of the existence of the open access technology, while those who are aware of it may have a misconception of it.

Thus, efforts that make OA possible to the Developing World, such as the World Health Organizations’ project known as the Health Inter-Network Access to Research Initiative (HINARI) and the Food and Agriculture programme known as Access to Global Online Research in Agriculture (AGORA), and other initiatives may not necessarily be sufficiently understood. This is where economic and political issues feature in the discussion. At the same time, the reality of a changing scholarly communication scenario has to be borne in mind because it is significantly based on electronic dissemination, and it is essential for governments to work towards enhancing access. According to Harris (2012), “policy moves from national to international government bodies will play a major role in influencing the scale of the transition to OA”. Accordingly, concentrating on disabling or discouraging it while the rest of the academic research world is focusing on OA implications, cloud computing alternatives, and other current technologies and a new scholarly publishing paradigm is counterproductive.

5. INSTITUTIONAL AND SUBJECT-BASED REPOSITORIES

An institutional repository (IR) is where large amounts of information is kept. The contents, size, and access permissions are determined by the institution. Perakakis and Taylor (2013, p. 261) suggest uploading a manuscript to a preprint repository as soon as it is ready for peer commentary. The reason is that institutional repositories can fill the role of hosting non-reviewed, unpublished manuscripts. The assumption is that university librarians then perform a quick check that manuscripts comply with requisite standards, and the name of the institution can be a first quality certification for the presented work. This puts academic librarians in the scholarly publishing cycle. According to Fain (2013, p. 28), IRs are “developed and maintained by librarians who are active players in helping create a culture of OA in their respective institutions, thus supporting the core value of access to information. OA repositories do not perform peer review themselves”.

There are also intra-disciplinary and multi-disciplinary repositories, such as arXiv (which covers physics, mathematics, computer science, nonlinear sciences, quantitative biology and statistics) that can host manuscripts by non-affiliated authors. It is furthermore possible to use an independent peer-review platform and invite experts to evaluate and comment on academic work. One can then update an open, online paper to reflect the last, peer-reviewed version. A digital platform allowing versioning is thus essential to gather in one place all information regarding the evolution of a manuscript, from first draft to the journal-published version, including the full text of peer reviews and other less formal comments by the community. As Perakakis and Taylor (2013, p. 259) point out:

with the advent of institutional repositories, intra-disciplinary and multi-disciplinary preprint archives, online libraries and even personal webpages and blogs, journals are no longer the only publication medium for academic research.

6. SELF-PUBLISHING

There are possibilities to publish one’s work as evidenced by Joanne Kathleen Rowling (2011) Harry Potter series using the Pottermore Platform that allows an interactive experience with the books. The Harry Potter wiki (2015) suggests that this is in reference to a London (UK) train station called King’s Cross because it has personal significance to her, but internet platform expertise was made successful by Sony. Although this is a complete departure from traditional publishing, distribution is driven by Rowling and facilitated by Bloomsbury Publishing. The experience of Fox and Patterson (2015) in self-publishing an academic textbook was with the use of CreateSpace which is an Amazon Print-On-Demand service. They make the comment that in marketing the book, one cannot visit a book fair and sit with one book to show as that becomes the terrain of big publishers and booksellers. They preferred that publishing platform because they appreciate the product reviews, and Amazon allows the bundling of the print books and e-books together in some countries. However, they suggest that online textbooks: might work for advanced graduate textbooks, where the audience is more sophisticated, happy to read longer texts, and more forgiving. We are skeptical it would work well for undergraduate textbooks as it is important to have clear, consistent perspective and vocabulary throughout the book (Fox & Patterson, 2015, p. 42). CreateSpace is just one of several self-publishing platforms and their details are easily available through internet
searching for the keyword “self-publishing”. What is equally needed in self-publishing is to consider product academic quality and its affordability. One has to estimate the development costs (paper, toner, visits, etc.). It is also important to avoid conflict of interest between the workplace and private interest. This is because it is an attempt to get by without the traditional publishers, and procedural errors may easily happen.

7. THE FUTURE OF SCHOLARLY PUBLISHING

While the new publishing paradigm activities are taking place, there is a growing restlessness about the unpredictable nature of the scholarly productivity trend if it is not checked. There have been questions such as posed by Price (2015) about “what do we really mean by “publishing” today? Are self-archiving mandates practical? Are impact factors accurate? Do embargoes serve the public interest? Are there better ways to conduct peer review? Why isn’t open access growing faster?”, The same issues were discussed at the Future of Scholarly Scientific Communication conference of The Royal Society in March 2015. That conference also included the question of scientific misconduct that arises out of the pressure on scholars to publish. This topic has a bearing on the validity, reliability, and authenticity of published works. Following the matter of scholarly conduct is the fact that there is a proliferation of blogs and other social media outlets that enable scholars to share and publicize their works. The impact of social media in publishing is undeniable in addition to IRs and OA. Because of this phenomenon, peer review becomes even more essential because scholars have to propagate well-researched thoughts and ideas. This brings to the fore platforms like Mendeley, Academia.edu and ResearchGate where scholars can post their works and enter into discussions with colleagues for collaboration purposes from all over the world where there is internet connectivity (although this has created clarification problems in the definition of OA issues and mandates between Academia.edu and Elsevier as reported in the Chronicle of Higher Education by Howard, 2013).

Alternatively, platforms such as LIBRE (http://openscience.com/libre-a-new-way-to-peer-review-scientific-papers/) as well as Publons (https://publons.com/) are available for the peer review process so that by the time an article is published in its final draft, it will have undergone several levels of review. Additionally, there is academic blogging that helps rapidly build one’s professional and personal portfolio widely. These approaches gratify web surfers with an appetite for academic content freely available on the web in a not-so-formal a manner. However, these also need regular updates just like the news because that is how they are utilized. This explains the tendency towards using altmetrics as a welcome addition to the way impact is measured, i.e. because there has to be a way of accounting for non-Scopus or Web of Science indexed scholarly publications and/or internet-based academic discourses. According to Price (2015), the Open Science Initiative Working Group of the National Science Communication Institute (nSCI) has had a yearlong conversation investigating ways of giving meaning and suggestions to the future of academic publishing. One of the suggestions made is to have a conference in 2016 as one of several over a ten-year period aimed at reaching an agreement on the way forward (Price, 2015). After that, to involve the United Nations Education Scientific & Cultural Organization (UNESCO) to enhance international collaboration and participation. The challenge that this approach may have is selling the agreement reached if some parts of the publishing community feel left out in crafting the plan, which should be taken care of by the ten-year deliberation series suggestion. Price (2015) also mentions the suggestion of an all-scholarship repository (ASR) as a method of capturing scholarly publications from all parts of the world. While these are ideas in their infancy, there still remain major questions that have already accompanied compliance with repository creation such as ownership and access debates, and this is the time to confront them and find solutions.

Copyright challenges in the electronic era deserve special mention. For example, the content created for Massive Open Online Courses (MOOCs) is openly available material used for teaching, and created by those who are providing the MOOCs. An EDUCAUSE brief (2013) points out that “professors most often own the rights to the courses and materials they develop, modify, and teach unless a specific agreement with the institution indicates otherwise”. The same brief suggests that it is necessary to continue discussing among several stakeholders (including the host university, the content creator, the students who are adding content as they participate, and the MOOC platform provider) to ensure clarity of purpose and a common understanding of copyright issues in a MOOC environment. This copyright consideration extends to the proliferation of scholarly content published online.

8. CONCLUSIONS

The scholarly publishing world is largely given momentum by the major academic publishers who influence how research and researcher impact are determined. It therefore makes sense for scholars to go back to the drawing board and determine what is good for scholarship. Moves such as those by the National Science Communication Institute are needed at this stage. For as long as tenure, grants, promotion, i.e. the research scholar’s prosperous livelihood, depend on prestige journals that have been established over a long time, then it is difficult for OA to make an impact for the near future. It is, however, possible that it will eventually be a viable

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popular option to use as it becomes more established, receives more grant funding backing, and senior scholars get convinced that their juniors in reliable spaces that are not a part of vanity press. Additionally, the involvement of major players such as Elsevier, Springer, IFLA/Brill, Sage, Emerald, etc. in the OA paradigm gives it authenticity – which goes to demonstrate the influence of publishers in academic productivity.

Traditional publishing continues, but newer models are emerging due to the availability of internet and the accompanying possibilities. It now has become a possibility to self-publish with a level of success that is better than during the pre-internet age. However, the example of Fox and Patterson (2015) demonstrates that it is necessary to select workable options so that the self-publishing process happens successfully. It is the competitive prestige of using well-established publishers that dwindles the efforts of those who want to avoid using them.

REFERENCES

FURTHER READING
FUTURE PROOFING OF TOURISM ENTREPRENEURSHIP IN OMAN FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

‘Vision 2040’ aims at developing tourism as a sustainable economic sector in the process of diversification of Oman’s economic activities from oil and gas sector.

The objective of the study is to find out and analyze the various factors that inhibits a tourism student’s inclination towards tourism related entrepreneurial activities in Oman. The study was conducted with 223 students of tourism studies who were selected on the basis on random sampling and were contacted through a well-defined questionnaire. The collected primary data was compiled, analyzed and a critical analysis was carried out using null hypothesis, chi-square and ranking tests.

The study reveals that the factors like non-discrimination of gender, promotion opportunities, and physical working conditions play a crucial role in motivating tourism. Our empirical results also reveal that the high risk of accidents, non-tourism spouse preferences, Omani traditional values discourage the attitude towards choosing tourism as their future job and hence setting up of such tourism related entrepreneurial activities. The main factors which impeding entrepreneurship tourism are the insufficiency of capital, lack of awareness about the ongoing programs and the lack of entrepreneurial skills. The study further demonstrates that there is a strong association between the motivating factors and the reasons for students choosing tourism as their studies. There exists necessity for the Government and the related sponsoring institutions to provide the necessary field skills training and create financial supporting schemes so as to encourage the young tourism entrepreneurs who will in venture with zest in the participation of diversifying Oman’s future economy towards tourism.

Keywords: Entrepreneurship Tourism in Oman, Factors impeding Entrepreneurship Tourism, Omani Tourism Students’ Perceptions, Tourism in Oman.

1. INTRODUCTION

Sultanate of Oman is one of Gulf (GCC) countries in the Middle East whose economy is stable and growth is progressive. It is no doubt that the economy is oil based. But the is a distant threat that Oman will run out of its oil resources in less than twenty years, has stimulated the Government to diversify its economy (Al Shanfari, 2012). Since 1970s Economic diversification has been given top priority due to unreliability of oil production as an income generator in the long run. Statistics shows that the oil production which was 960,000 barrels a day, reduced to 800,000 barrels a day in 2010 (MEED, 2010). In fact all the Gulf Cooperation Council (GCC) states are pursuing economic diversification seriously through investments and projects (Martin Hvidt, 2013). As pointed out by Cook and Nielson (2011), every country is following its own plan for diversification, including Oman, which is building a service and tourism industry. His Majesty Sultan Qaboos during 29th National day addressing to the Nation said that the tourism industry is well capable of serving the aims of regional development, since its benefits will cover all regions. On the 38th national day of Oman, His Majesty reaffirmed the necessity to give tourism priority in the country's future development programs. He added that "The tourism industry is well qualified to offer career opportunities to Omanis”.

Globally the Tourism Industry is estimated to have directly supported 100,894,000 jobs in 2013 and has made a direct contribution of USD 2,155.4 billion in 2013 (2.9% of total GDP) worldwide. It is 9.5% of the GDP and the total contribution tantamount to USD 6990.3bn in 2013 (WTTC, 2014). It estimates this figure to grow to 126,257,000 jobs or 3.5% of total employment by 2024. Therefore most of the countries started viewing Tourism as Industry which is viable and sustainable alternative one to fuel their economies (WTTC, 2014) and Sultanate of Oman is no exception to it. Sultanate of Oman has started implementing the policy of diverting oil based economy towards tourism economy and it is a part of Vision-2040. Vision 2040 aims in providing suitable conditions for economic diversification by increasing the non-oil production in the country (MONE, 1995). The Vision 2040 which covers the period 1996-2040 underlines the importance of the same. The Vision 2040 includes a plan to make tourism the next main source of income for Oman after Oil and Gas. The mission statement clearly states that, "Tourism will help to facilitate economic diversification, preservation of cultural integrity and environmental protection of Sultanate of Oman”, (MOT, 2015). In Oman, though the Government set aside RO 298 million for
development of Human Resources for all the industries including the tourism industry, the localization drive has met with limited success due to gaps such as lack of interest in joining the hospitality sector; lack of skilled Omani staff especially with regards to language skills in the tourism industry in general and tour guidance specifically (TOO Aug. 2014).

The Government has recognized the need to train and educate more Omani nationals to prepare them for taking up employment in the tourism and hospitality sector (Bontenbal and Aziz, 2013). Omanization in tourism sector is boosting up the nationals to take up the jobs in the tourism and hospitality industry. Confirming this is the Omani ministerial Decree No.159/2003 which enforces 100% Omanization of employees in the un-skilled labour force in the tourism sector (MOM, 2003).

The employment criteria in the tourism sector has been geared up in the tourism and hospitality sector since 2003 vide Ministerial decree No.165/2003 which demonstrates the Omanization plans in the tourism sector to increase up to a certain percentages of 2007 viz. 83 % in airlines, 100 % in tourist restaurants, 80% in travel agents and 75% in 3/4/5 star hotels (MOM, 2003a). Despite such efforts the target is yet to be reached. The following table shows the prevailing status of workforce employed in Tourism Sector:

//Table 1/

Since 2000, there have been various reforms in order to improve and facilitate foreign investments. With the induction of the country into WTO (in 2000) its strategy of promoting tourism industry to enhance private sector participation has been successful. With this, the country’s other objectives like including remote areas within this development, as well as increasing employment opportunities for its citizens became easily achievable.

In the current VIII year plan (2011-2015), the government has allocated a huge amount for the development of tourism infrastructure. It spent RO 2084 million for Airport and Port construction and RO 1233 million for development and expansion. RO 503 million was allocated for Road improvement and development. In addition sanctions were given for the construction of additional 3000 hotel rooms by the end of 2014.

All these investments saw a positive effect on the tourist arrival leading to an increase in tourism revenue for the country. As per WTTC (2014) statistics, Oman’s Travel and Tourism industry made a direct contribution of 3% to the GDP (RO 982.8 Million). This is expected to grow by 5.4% per annum, leading to an overall contribution of 3.9% (RO 1834.2 Million) by 2024. The employment generated by this industry was at 3.3% of the total employment in the country, which accounted for 37000 jobs. This is expected to increase to 60000 jobs by 2024. This means that the Omanization targets could easily be met. Omanization meant localization of jobs.

2. REVIEW OF LITERATURE

It is argued that a country’s development and economic growth can be achieved by promotion of enterprise among students – a trait which requires knowledge of entrepreneurship, financial resources, and favorable business environment (Milius & Sarkiene, 2008). With more tourism and hospitality projects being undertaken both in the cities and in the rural areas, there are a lot of potential for starting up small and medium enterprises (SMEs) which cater to the burgeoning tourism sector. Given the fact that tourism has huge potential to create employment and entrepreneurial opportunities development of tourism becomes vital for Oman’s economic development (Sokhalingam et.al, 2013). According to Kirby (2003), entrepreneurial activity should not be seen as a creation of new small firm but as something which operates much more broadly in all sectors of the economy. Entrepreneurship is the product of a belief and the ability of a potential entrepreneurs, whether he actually undertake this activity or not (GEM, 2011).

Entrepreneurship towards tourism sector now-a-days called Entrepreneurship Tourism is a welcoming approach catering to the needs of the growing tourism industry. Tourism is one of the economic sectors in which a great degree of involvement is needed by the entrepreneurial community (Chilembwe and Gon大夫e, 2013). There are many factors that lead to entrepreneurial development and one of the factors is availability of an opportunity in the market that is viable and profitable (Burrow et al, 2008). According to Theresa Ryan (2012) entrepreneurs play an important role in tourism development due to shared culture for tourism and this in turn can lead to success in tourism development. She refers to the claim made by Koh and Hatten (2002) that “a community’s quantity and quality of supply of entrepreneurs significantly determines the magnitude and form of its touristscape because the tourism entrepreneur is the persona causa of tourism development”. In fact they even believe that a well-endowed tourism industry would never evolve successfully without tourism entrepreneurs (Koh and Hatten, 2002). According to Martin Hvidt (2013) Oman like its GCC counter parts is was striving to steer its citizens (both men and women) to educate and compete for jobs in the private and public sectors. Yet it is observed that Omani students are not keen in taking up professions in the tourism and hospitality industry even though there is very good scope and enormous job opportunities in Tourism sector of Oman. Tourism sector has wide of range of jobs including Travel agencies, tour operations, ground handling services, accommodation facilitations, hotel and catering services and car hiring services etc. Even the parents of the students, especially from a semi-traditional
context do not support their decision as they believe that the jobs in this industry is ‘servitude’ and have little prospects of promotion from rank-and-life (Pang, 2010). This might be the reason as stated by Pizzam (1982) that the employees are often seen as being uneducated, unmotivated, untrained, unskilled and unproductive. This is confirmed by Mahony and Sillitoe that many positions within this industry needs only little experience and low skills (O’Mahony and Sillitoe, 2001). According to Roney and Oztin (2007), though the Tourism Industry is credited with employment generation, the jobs themselves were low paid, and mostly needed low skills. In order to understand this, Kusluvan (2003) deems it important to understand it from the perspective of tourism students who are currently undertaking their course or those who have recently graduated. Casado (1992) on investigation found that the basic expectations of these students to be ‘fairly realistic’ before their graduation period. But with progression into their degree course, notes Jenkins (2001, the students’ perceptions of the industry deteriorate. Thus it is argued that commitment to tourism and hospitality industry will be affected by the fact that the future workers of the industry, who though potential recruits have a negative image of working in the industry (Aksu and Koksal, 2005). The same was confirmed by Richardson during his study on undergraduate students who are studying tourism and hospitality in Australia. The students believed that the industry does not offer them the attributes necessary to make it attractive as a future career. (Richardson, 2009).

For a country like Oman where 78.4 percent of the population falls under the age of 35 and an unemployment rate is estimated to be 15 percent, focus on employment creation becomes crucial. This is a tough job considering there are nearly 50000 graduates entering the main stream every year. Thus encouraging entrepreneurial activity is the only option to creating employment opportunities. But no amount of planning will help if there is no will power to become self-employed (Ennis, 2015). Though Oman has traditional entrepreneurship there is presently a lack of the same. And the reason is its new found wealth. An academic survey by the Sultan Qaboos University (SQU) confirmed the fact that the “spirit of entrepreneurship has been replaced by a notion of entitlement”. Added to this there was shortage of ‘role models’, lack of proper training, unrealistic goal setting, as well as lack of planning skills and experience (Parambi, 2014). But to be fair this is not a trend isolated to Oman alone. It can be observed how America was once famous for its innovative and creative entrepreneurs. But today, it was fast becoming a victim towards Entitlement Culture (Tarkenton, 2012). ‘Entitlement Culture’ means how people are constantly looking for government help. This mind set directly affects the entrepreneurship spirit. Many feel starting up an enterprise is a hard work. On the above line, though various Governments sponsored schemes and supporting programs are available to the budding Omani entrepreneurs, only a handful of attempts have been made in entrepreneurship tourism.

In the recent past, Colleges from Tourism & Hospitality Studies in Oman has been facing many drop outs in the courses offered by them which is trivial from the Statistical Bulletin of Oman. Though various researches have been carried out to find out the reasons for the turn over from the industry, the root cause of the problem remains unsolved. Therefore this research focusses on the study of the students’ perception and the impediments towards setting up of entrepreneurial units in tourism.

3. RESEARCH METHODOLOGY

The survey was conducted among the students from various colleges of Tourism and Hospitality Management Studies in Oman. 223 questionnaires were distributed. To confirm accuracy, the questionnaires were personally handed over to the students and unbiased responses were collected helping them through translating and supplementing with the necessary explanation wherever required.

4. DATA ANALYSES AND FINDINGS

   //Table 2/

From the above table No.2, the demographic details of the respondents are observed.

   //Table 3/

It is evident from the above table No.3 that the p value is less than 0.05 i.e. the null hypothesis is rejected, i.e. there is a significant relationship between gender and the home town. Therefore the claim that the home town influences the respondents’ gender effective in becoming tourism students is proved positively.

   //Table 4/

It is evident from the above table No.4 that p value is less than 0.05. Therefore the null hypothesis is rejected at 5% level of significance. I.e.it connotes that there is a significant relationship between the statements pertaining to the reason for selecting tourism and hospitality course and the choices of the respondents. Thus, the claimed assertion that ‘the issues (statements) play a dominant role in affecting the selection of tourism and hospitality course’ is proved positively. Further, it is evident from the Kolmogorov-Smirnov test values that ‘A future career in
Tourism’ was ranked first among the factors followed by the factors ‘Getting a scholarship’ and ‘The only major I was offered’.

//Table 5/
It is evident from the above Table No.5 that p value is less than 0.05. Therefore the null hypothesis is rejected at 5% level of significance. I.e. it connotes that there is a significant relationship between the statements pertaining to personality traits and the choices of the respondents. Thus, the claimed assertion that ‘statements play a dominant role in affecting the personality traits’ is proved positively. Further, It can be seen from the Kolmogorov-Smirnov test ranking in the above table that the respondent believe the prime personality trait towards tourism is ‘Love to meet people’ followed by ‘Love to work with people with different culture’; followed by ‘Love to travel’.

//Table 6/
Kolmogorov-Smirnov test value is 1.1067 which clearly shows that there is significant relationship between rank factors and factors involved in selecting a job. It can be seen from the Kolmogorov-Smirnov test ranking in the above table that the respondent believe the prime reason for selecting a tourism job is ‘Good starting salary’ followed by ‘A society respected job’; followed by ‘A job acceptable by family’.

//Table 7/
It is evident from the above table No.6 that p value is less than 0.05. Therefore the null hypothesis is rejected at 5% level of significance. I.e. it connotes that there is a significant relationship between the statements pertaining to the motivating factors and the choices of the respondents. Thus, the claimed assertion that ‘the motivating factors (statements) play a dominant role in affecting the selection of tourism and hospitality course’ is proved positively. Further, it is evident from the Kolmogorov-Smirnov test values that ‘No sex discrimination in the Tourism industry’ was ranked first among the factors followed by the factors ‘Good Physical working conditions’ and ‘There is always something new to learn in this tourism job’.

//Table 8 /
It is evident from the above table No.7 that p value is less than 0.05. Therefore the null hypothesis is rejected at 5% level of significance. i.e., it connotes that there is a significant relationship between the statements pertaining to the reason for not joining the tourism and hospitality courses and the choices of the respondents. Thus, the claimed assertion that ‘the issues (statements) play a dominant role in influencing the non-selection of tourism and hospitality course’ is proved positively. Further, it is evident from the K-S values that ‘High risk of accidents in the tourism industry’ was ranked first among the factors followed by the factors ‘Omanis do not prefer to marry a boy/girl from tourism industry’ and ‘No job security’.

//Table 9/
It is evident from the above table No.8 that p value is less than 0.05. Therefore the null hypothesis is rejected at 5% level of significance. i.e. it connotes that there is a significant relationship between the statements pertaining to the reason for discouraging tourism to start your own business and the choices of the respondents. Thus, the claimed assertion that ‘the issues (statements) play dominant role in discouraging to start your own businesses, is proved positively. Further, it is evident from the Kolmogorov-Smirnov test values that ‘Interested in Government jobs’ was ranked first among the factors followed by the factors ‘not sufficient entrepreneurial skills’ and ‘Insufficiency of capital’.

//Table 10 (a), (b), (c) & (d)//
The obtained linear regression is \( V_2 = 27.936 + .114 \ V_1 \) where \( V_1 \) = Motivating Factors and \( V_2 \) = Reason for selecting Tourism studies. It can be seen from the above that this factor has impact on the reasons for students’ election.

5. RESULTS
In spite of tremendous supporting programmes offered by Governmental organizations and other institutions such as SANAD, Intilaqah, and JUSOOR etc. in the development and promotion of entrepreneurship and tourism, the number of SMEs emerging in this sector are very rare.

Among the respondents, 84.8% of them have joined the tourism courses on their own interest. Females are the majority of the students (95%) motivated towards joining tourism studies. It can be observed that most of the tourism students are from Muscat and followed by Sohar. According to the ranking by the respondents, among the reasons for selecting tourism studies ‘A future career in Tourism’ ranked first followed by the factors ‘Getting a scholarship’ and ‘the only major I was offered’. The personality trait towards tourism is ‘Love to meet people’ followed by ‘Love to work with people with different culture’; followed by ‘Love to travel’. The prime reason for
selecting a tourism job is ‘Good starting salary’ followed by ‘A society respected job’; and ‘A job acceptable by family’ respectively. The main motivating factor affecting the students towards selecting tourism course is ‘No sex discrimination in the Tourism industry’ followed by the factors ‘Good Physical working conditions’ and ‘there is always something new to learn in this tourism job’. The factors for the non-selection of tourism and hospitality course is ‘High risk of accidents in the tourism industry’ followed by the factors ‘Omanis do not prefer to marry a boy/girl from tourism industry’ and ‘No job security’. Among the various courses available, majority of the respondents (87.4%) preferred to study Tourism Management as their major course of study and the majority of the students (69.5%) join tourism studies on the ministerial scholarship and only 23% of the respondents spend their own funds to join the tourism studies. It is clearly observed that 66.8% of the respondents are not aware of the different career paths available in Tourism and 76% of the respondents are unaware of the recent developments taking place in the Tourism sector. 87.9% of the respondents are unaware of the Tourism promotions and campaigns by the Government. Further, 73.1% are unaware of the job vacancies in Tourism and 93.7% of the respondents never even applied for jobs based on the advertisements. It can be observed that 33.2% of the respondents have shown interest to venture into entrepreneurial tourism i.e. to start their own tourism business and the reasons for discouraging students to start your own business is ‘Interest in Government jobs’ followed by the factors ‘Not sufficient entrepreneurial skills’ and ‘Insufficiency of capital’.

Further ANOVA test results shows that there is a strong association between the motivating factors and the reasons for students choosing tourism as their studies whereas the personality traits do not have any impact on the selection.

6. CONCLUSION, DISCUSSION AND MANAGERIAL IMPLICATIONS

The prime reasons for the students to drop out from the tourism studies and discontinue the courses are the lack of awareness of the career path and the future scope in the tourism sector. According to Rampton (2014) entrepreneur must have 5 five striking personality traits. They include Passion, Resilience, Strong Sense of Self, Flexibility and Vision. But the passion declines gradually and risk aversion is developed. Oman students prefer to join either 4/5/6 star hotels or prefer to work in time specific, sophisticated white collar jobs. They are not prepared to take risk in venturing into tourism sector. Further, the most important factor impeding the growth of entrepreneurship tourism is financial constraints in the initial setup. Though various entrepreneurial programmes have been launched by Government of Oman and other leading organizations in Oman, entrepreneurial tourism has been neglected to an extent. They are focused towards Hotel management and the related services. Tourism students who join initially with full zest, lose their initiative just because of their lack of awareness about the future of the industry and the insufficient campaign and promotional initiatives by the Government. Majority of the tourism sector business in Oman is controlled by Non-Omani dominated multinational companies. Thereby, there is leakage of national income from the tourism industry. This makes it reason enough for the sponsoring organization and the Government to pay immediate attention to entrepreneurial tourism. There seems to be an international awareness to this – says Renata Cooper (2015). She further added that the ‘fear to fail’ attitude, lack of a mature venture capital market as well as lack of education. She proposed more involvement from the Government, banks and other financial institutions as well as mentoring to encourage a sustained growth of entrepreneurial tourism. Gellner and Moog (2008) argued that the overall planning by the relevant authorities should be balanced in such a way that the availability of financial capital to make entrepreneurship in the tourism sector more attractive.

As suggested in the Effective forces Model (given above) by Khan (2009), the entrepreneurship tourism can only be activated with the Governmental assistance and the sponsoring institutions due to entitlement culture. Hurried policies or halfhearted implementation of the same will not help in achieving the goals set. Cultural aspects not withstanding tourism students are still tempted to enter the entrepreneurship because of the perception of earning appreciable profit. But financial problems seems to create hurdles resulting in operational losses and closures of their business. Many blame that the governmental financial programs were still not available to all and the ground reality was far different than those on paper. Policy makers should remember that while young people are willing to take risks, are more creative and innovative, they are also impatient and easily put off. Hence the Governmental as well as private Financial Institutes that are willing to provide financial assistance to budding entrepreneurs should make themselves more approachable and their advance procurement procedure less complicated. There should also be plans to encourage a better Venture Capital mechanism in Oman. Private stakeholders should support the Governmental in a big way in order to provide other types of assistance. This assistance may be offered in form of training, and as well as consultation support from the early stage of writing a business plan until the set up stage. A system of mentoring is definitely needed for new entrants through support groups. A conducive climate should be provided wherein failing in a venture should not be looked down but supported as a learning process. Pride in self-reliance as well as in the entrepreneurial spirit should be promoted at all levels. Tourism entrepreneurs meets and awards should be held on a more frequent basis with media coverage to promote the successful entrepreneurs as role models. The success of every tourism entrepreneur should be celebrated in order to breed more of them. Synchronization should be made between the Tourism and Hospitality professional associations and the SME’s so that there are more understanding and business deals amongst them. This will help the small business survive
competition. The educational institutes who harbor the youth, need to design their “Tourism and Hospitality” curriculum inclusive of theoretical as well as practical entrepreneurship. They should work together with all stakeholders to develop and promote entrepreneur skills among the youth so as to kindle their entrepreneur spirit.

There should be proper data available and recorded so as to have a record of entrepreneurial successes and failures. This will help policy makers in making policies to prevent eroding of the entrepreneurial spirit. Youth are the future of Oman. When all the stakeholders work together to support and sustain the spirit of Tourism Entrepreneurship, the outcome can only be positive. Policies that are based on ground realities will help in future proofing the sustainable growth of Tourism in Oman.

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Fig. 1 showing the Effective Force Model (E F Model) of a successful Entrepreneur


[26] MOT, (2014), Tourism Strategy in Oman, 2014, available at the website http://www. omantourism.gov. om/wps/wcm/connect/6ae87e00435ce2f5b1c4fba65c0f36c/ Tourism_Stratigiey_in_O man.doc?MOD=AJPERES&CONVERT_TO=url&CACHEID =6ae87 e00435ce2f5b1c4fba65c0f36c


APPENDICES

Table 1. Showing the Manpower/Labour in Tourism Sector 2013

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Omani</th>
<th>Expatriate</th>
<th>Total</th>
<th>Omanization %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airline Agencies</td>
<td>3152</td>
<td>2163</td>
<td>5315</td>
<td>59.30</td>
</tr>
<tr>
<td>Tourism Agencies</td>
<td>1265</td>
<td>2312</td>
<td>3577</td>
<td>35.36</td>
</tr>
<tr>
<td>Accommodation</td>
<td>2724</td>
<td>6608</td>
<td>9332</td>
<td>29.19</td>
</tr>
<tr>
<td>Car Rentals</td>
<td>210</td>
<td>124</td>
<td>334</td>
<td>62.87</td>
</tr>
<tr>
<td>Totals</td>
<td>7351</td>
<td>11207</td>
<td>18558</td>
<td>39.61</td>
</tr>
</tbody>
</table>

Source: Al Balushi, A A, Human Resources Dept., Ministry of Tourism, 2014

Table No. 2 Showing Demographic information about the respondents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>M</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>128</td>
</tr>
<tr>
<td>Home Town</td>
<td>Ibra</td>
<td>6</td>
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<tr>
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<td>Recent Developments</td>
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Source: Questionnaire

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</tr>
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<td>Muscat</td>
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<td>Musandam</td>
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<tr>
<td>Nizwa</td>
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<td>Sohar</td>
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<td>Salalah</td>
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Chi-Square Tests

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Table 5. Showing Personality Traits

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<th>SA</th>
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<th>( \chi^2 )</th>
<th>P value</th>
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<td>1</td>
<td>Love to travel</td>
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<td>23</td>
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<td>Love to meet people</td>
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<td>47</td>
<td>160</td>
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<td>3</td>
<td>Do not mind working in shifts</td>
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<td>4</td>
<td>Love to work with people with</td>
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<td></td>
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<td>4.999</td>
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<td>different culture</td>
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<td>12</td>
<td>25</td>
<td>34</td>
<td>68</td>
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<tr>
<td>5</td>
<td>Love to work abroad</td>
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<td>68</td>
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<td>34</td>
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Table 6. Showing the Factors during selecting a job

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<td>23</td>
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<td>Pleasant working condition</td>
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<td>66</td>
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<td>Promotion Prospects and faster career growth</td>
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<td>A job acceptable my family</td>
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<td>49</td>
<td>9</td>
<td>17</td>
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<td>Bonus and other perquisites</td>
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<td>Straight working timings – no heavy work load</td>
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<td>18</td>
<td>9</td>
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<td>13</td>
<td>International opportunities</td>
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<td>3</td>
<td>17</td>
<td>23</td>
<td>78</td>
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<tr>
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<td>Job contributing good to the society</td>
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### Table 7. Showing the Motivating factors towards Tourism jobs

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<td>Physical working conditions are good in Tourism</td>
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<td>Plenty of job openings available in Tourism Industry</td>
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<td>There are lots of promotion opportunities in Tourism job</td>
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### Table 8. Showing the Reasons for not joining the Tourism Industry

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<td>Tourism job is not respected in Omani Society</td>
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<td>40.4%</td>
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<td>Omani do not prefer to marry a boy/girl working in Tourism Industry</td>
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<td>There are high risk of accidents in the Tourism Industry</td>
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<td>Promotion opportunities are less</td>
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</tr>
<tr>
<td>8</td>
<td>Pay is low and not sufficient</td>
<td>8</td>
<td>20</td>
<td>30</td>
<td>67</td>
<td>98</td>
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<td></td>
<td></td>
<td>3.6%</td>
<td>9.0%</td>
<td>13.5%</td>
<td>30.0%</td>
<td>43.9%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td>Fringe benefits (bonus, holiday, meals) are insufficient</td>
<td>3</td>
<td>11</td>
<td>49</td>
<td>70</td>
<td>90</td>
<td>3.596</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1.3%</td>
<td>4.9%</td>
<td>22.0%</td>
<td>31.4%</td>
<td>40.4%</td>
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<td></td>
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</tr>
<tr>
<td>10</td>
<td>Working in Tourism is in contradiction to my family values / Traditional values</td>
<td>17</td>
<td>17</td>
<td>26</td>
<td>62</td>
<td>101</td>
<td>3.749</td>
<td></td>
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<td></td>
<td>7.6%</td>
<td>7.6%</td>
<td>11.7%</td>
<td>27.8%</td>
<td>45.3%</td>
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Table 9. Showing Discouraging factors towards tourism

<table>
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<tr>
<th>#</th>
<th>Statements</th>
<th>SD</th>
<th>D</th>
<th>UD</th>
<th>A</th>
<th>SA</th>
<th>K-S value</th>
<th>( \chi^2 )</th>
<th>p value</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>No Self interest</td>
<td>22</td>
<td>46</td>
<td>15</td>
<td>29</td>
<td>28</td>
<td>2.831</td>
<td>103.857</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>Risk</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>52</td>
<td>59</td>
<td>2.960</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Insufficiency of capital</td>
<td>3</td>
<td>3</td>
<td>20</td>
<td>42</td>
<td>72</td>
<td>3.536</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Not sufficient entrepreneurial skills</td>
<td>5</td>
<td>5</td>
<td>22</td>
<td>35</td>
<td>73</td>
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<td>5</td>
<td>Interested in Government jobs</td>
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<td>4</td>
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<td>33</td>
<td>87</td>
<td>4.302</td>
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Table's No. 10 (a), (b), (c) and (d) showing the Results of Analysis of Variance Test after elimination

Variables Entered/Removed

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<th>Variables Entered</th>
<th>Variables Removed</th>
<th>Method</th>
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<tr>
<td>1</td>
<td>MOTIVATING FACTORS TOWARDS TOURISM</td>
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Model Summary

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<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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<tr>
<td>1</td>
<td>.135</td>
<td>.024</td>
<td>.022</td>
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ANOVAR

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<tr>
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<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>1</td>
<td>75214</td>
<td>1</td>
<td>75214</td>
<td>5.422</td>
<td>.021</td>
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<tr>
<td>Residual</td>
<td>3065800</td>
<td>221</td>
<td>13872</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3141013</td>
<td>222</td>
<td></td>
<td></td>
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</tbody>
</table>

Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOTIVATING FACTORS TOWARDS TOURISM</td>
<td></td>
<td>27.936</td>
<td>1.068</td>
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<td></td>
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<td>.114</td>
<td>.049</td>
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ABSTRACT

The objective of this enquiry is to explore the effects of creative accounting on the financial achievements financial position and cash flows of an organization that uses creative accounting techniques, manipulates financial reporting and show unrealistic results. This paper consists of a discussion about different relations between creative accounting and corporate governance and its effect on management and shareholders. This paper covers professional judgments and involvement related to creative accounting and ethical responsibilities of professionally and academically qualified managers, and other professionals who are considered as business stakeholders. A discussion addresses the involvement of those professionals who support in certain decisions related to creative accounting instruments. A comprehensive dialogue on clarification part of the creative accounting is a vital portion of this research paper. ‘True and fair view’ of a company’s financial achievement and financial status is very important not only from audit and assurance point of view but also establishes a sound code of corporate governance. I have focused my research towards specific queries to find out the relationship between several variables on individual basis towards creative accounting, such as capital market techniques, involvement of directors, goodwill of the firm, internal control mechanism, audit standards and product-market conditions. The term creative accounting generally misunderstood in the world of finance due to financial scandals, however, history tell us that it has brought ripple positive effects in the lives of many organizations towards success and solvency.

Keywords: Professional practices on Creative Accounting, governance on Corporate, audit-assurance relations, financial reporting.

1. INTRODUCTION

The approach to creative accounting is generally considered as it is a negative act an act of deception, manipulation and dishonesty. However, a mature mind understands that it is just like a knife, if it is used with wisdom, may provide enormous amount of benefits to all the stakeholders. By the support of creative accounting large number of organizations have come out of the financial crises and got revival of financial freedom. Creative Accounting is an interesting topic of research among academicians and professional research community. It influences many areas of risk management and financial reporting. There are number of questions and concepts I have come across during this research. One must know about the background of Accounting and basis of Accounting, which is known as ‘Double Entry System’ of Accounting. Double Entry System of Accounting, created by Luca Paciolo around 600 years, who was a teacher, author and an Italian mathematician. We should know that as per International Financial Reporting Standards, Accounting practices follow certain set of laws, rules, concepts, principles and regulations, however, “a process whereby accountants use their knowledge of accounting rules to manipulate the figures reported in the accounts of a business” (Sue Chong). A question arises here; is the practices of Creative Accounting are legal? In fact, under Creative Accounting those accounting practices are applied which may or may not follow the regulations of standard practices and deviated from those principles and concepts. Advocates and opponents both referred Creative accounting as “Innovative’ or ‘aggressive’ respectively. It is interesting to note that in financial literature, Creative Accounting is considered as a systematic misrepresentation of contents of statement of financial performance, statement of financial position and Statement of Cash Flows.

2. DEFINITIONS OF CREATIVE ACCOUNTING

Creative Accounting addresses the application of accounting knowledge to influence financial reporting of an organization in a lawful way, keeps validity towards accounting rules, concepts and policies and express intelligently the desires of management in support of stakeholders. Some of reputed scholars and researchers define the creative accounting as follows:

1. It is the deliberate dampening of fluctuations about ‘some level of earnings considered being normal for the firm’”. (Barnea et al. 1976).

2. “Every company in the country is fiddling its profits. Every set of published accounts is based on books which have been gently cooked or completely roasted. The figures which are fed twice a year to the
investing public have all been changed in order to protect the guilty. It is the biggest con trick since the Trojan horse. In fact this deception is all in perfectly good taste. It is totally legitimate. It is creative accounting.” (Ian Griffiths, 1986:1).

3. “Creative accounting is the transformation of financial accounting figures from what they actually are to what preparer desires by taking advantage of the existing rules and or ignoring some or all of them”. (Kamal Naser, 1993:2).

4. Is any action on the part of management which affects reported income and which does not provide true economic advantage to the organization and may in fact, in the long-term, be detrimental”.(Merchant and Rockness, 1994).

3. OBJECTIVES

Objective of this research is to explore out the arrangement and relationship between creative accounting, to see how different players in industry who applied the techniques of creative accounting to manipulate their financial statements. This research will find out the ways which are used for window dressing by professionals and solutions against creative accounting so the impact might be reduce. It is also important to note that due to creative accounting some of the stakeholders get temporarily benefits, however, there are after effects which takes an organization towards collapsed. The famous companies like Enron and WorldCom have applied creative accounting techniques and manipulated their financial statements; the result was a complete failure of fate for good. It is vital to understand the application of creative accounting in existence of accounting standards, either the standards become a support or a threat. In fact, accounting standards have many loopholes in presence of different concepts and methods, like allocation of depreciation, recognition of cost and revenue, stock valuation, which provide a chance to professional accountants for manipulation in accounts. Audit reports play significant role to portray an ethical picture of the financial statements and stakeholders trust them for their wealth and addition to wealth. So, it is clear that auditors take serious notice of the practice and impact of creative accounting.

4. LITERATURE REVIEW

There are certain numbers of standards, which I have studied as literature review of this research. Standards provide a sound insight to creative accounting approach. Hussey & Ong (1996) has highlighter their views related to standards to discuss the concept of creative accounting.

FRS 1 Cash Flow Statement.

Publication of a statement of cash flow is mandatory requirement for companies as per directions in FRS 1 of Accounting Standard Board. An organization has no liberty to manipulate profit as cash with the support of creative accounting.

FRS 2 Accounting for Subsidiary Undertakings.

FRS 2 has disclosed more clear arrangements for consolidations under group accounting between a parent company and its subsidiary companies. In early eighties, there were number of complex issues came in press, while companies have disclosed profits without showing source of revenues and did not disclose certain obligations and economic resources from their statement of financial position by taking advantage of group approach of financial reporting.

FRS 3 Reporting Financial Performance.

Transformation of profit and loss has been expressed by FRS 3 Reporting Financial Performance. It states that concentrating on a single figure of profit; companies must disclose information which reflects the many elements associated with profit.

FRS 4 Capital Instruments.

This standard addresses many definitions related to statement of financial statement. It provides guidance for their disclosures as well. The objective of this standard is to ensure that capital instruments are shown by companies at the time of financial reporting.

FRS 5 Reporting the Substance of Transactions.

The reality of economic substance is very important at the time of production of financial statements. In past companies were practicing just the legal aspect of the transactions, which is not appreciated as per substance over form. There are certain matters like, consignments of stock, factoring of debts and sale and purchase agreements which have been rectified by FRS 5- Reporting the Substance of Transactions and set out their logical and appropriate definition to make financial reporting to provide a fair view.

From all these pronouncements of FRSs, it is clear that a mere application of Creative accounting is not sufficient to
show all aspects of financial reporting by progressive organizations. Discussion and arguments related to creative accounting started almost five decades before. **Park (1958)** kept different approaches to explain the type of thoughts necessary for developing accounting ideas and principle. He was an advocate of creative accounting. According to him, “Creative thinking is necessary for measuring enterprise financial position, performance and providing information geared to managerial decision making”. Cost allocation and product lines also gets impact of creative accounting. **Littrell (1980)** stated about the issue of creative accounting related to cost allocation between product lines and transfer prices between subsidiaries, which become matter of public records in rare and supposed to be internal accounting affairs. **Naser (1992)** stated that much is written about Creative accounting and about the various schemes of window dressing and off-balance sheet financing and very little information is available how widely such schemes are used by various companies. He has done a little empirical study to explore the practice of creative accounting in different organizations; however, he found that it was difficult to get data from companies about their own creative accounting practices. Finally he came to a conclusion that private companies provided most frequent encountered to different examples of creative accounting and interesting fact was that all companies in trading and industrial sector appears to make some use of creative accounting. Creative accounting was tested in the domain of security market as well. **Shah (1996)** examined the process of creative compliance in case of complex convertible securities issued by U.K. listed companies between years 1987-1990. Further, in the same period **Blake & Salas (1996)** explained that creative accounting is seen as widespread in the U.K. and undermines the credibility as a disease. **Smith (1998)** has disclosed that how accounting manipulations employed by 208 of the largest quoted UK companies and identified 12 different techniques in the common use, all of which would impact on the Statement of Comprehensive Income and statement of financial position of the companies concerned. He classified accounting firms as “structured”, “intermediate” or “unstructured” in terms of their audit methodologies and how some practice creative accounting to support their clients. **Amat, Blake & Dowds (1999)** perceived the various methods of creative accounting could be considered and fall in four categories:

I. There are different options to choose accounting methods; sometimes like in many countries for example; a company is allowed to choose between a policy of writing off research and development expenditure and as it occurs and amortized it over the life of the related project. A company can therefore choose that accounting practice which gives preferred image.

II. Some entries in accounting involve an unavoidable degree of estimation, judgment and prediction. In some cases for example, estimation of life of an asset for calculating depreciation. These estimates are normally made inside the business and the creative accountant has opportunity to manipulate on the side of caution or optimum in deciding estimate.

III. Artificial transactions can be entered for the purpose of manipulate balance sheet amounts and increase profits between accounting periods, which is achieved by two or more related transactions with obliging third party, normally a bank.

IV. Genuine transactions can also be timed so as to give the desired impressions in accounts.

**Healy & Wahlen (1999)** described about how standard setters should decide about accounting standards to reduce the possibility of earning management. Information about the company is provided by the financial reporting which shows the true and fair view of company but managers manipulate the financial numbers than actual due to their personnel interest like to increase their management compensation, to provide low salary to lower management and employees, to pay fewer dividends to shareholders. It must be considered that due to these practices, a divorce between ownership and control is possible and the fate of the organization comes in risk. Researchers have covered auditor’s mindset as well towards creative accounting. **Rabin (2005)** described about auditors attitude towards creative accounting and ethical behavior of auditors. Ethical judgment is a fundamental requirement for auditors in forming opinion whether financial statement fairly presents the financial performance and financial position and statement of cash flows. Auditor’s ethical judgment is formed by the provisions of the code of conducts given in international auditing standards towards organizational policies governing ethics and individuals own moral agency. **Balaciu, Bogdan and Vlada (2009)** have tried to protect creative accounting. They have given a short review of creative accounting topics and its development to know about what are the motivations for creative accounting literature and solution to this term. They tried to correlate creative accounting with different interest areas like bankruptcies, audit, governance, financial market, the public sector and quality of financial reporting to prevent creative accounting and to show its importance for the organizations. In last five years an enormous amount of work was carried by researchers from all over the world. **Moldovan, Achim and Avram (2010)** focused on how information provided by accounting effects external users. He emphasizes that how and why distorted information flows outside of the entity reach to those people who are at risk factor for the organization. He explained an inverse
relationship between creative accounting and true and fair view of transactions. Subjectivity rules here provide different aspect of a transaction, which is not suitable in terms of quality of information. The management, however, is responsible to express true and fair view as per rational thoughts of stakeholders. Researchers have made substantial attempts to find out the validity of creative accounting in relation to accounting scandals. Balaciu, (2011) has taken examples of these accounting scandals that have left traces in the history due to their strong impact. Enron phenomenon, WorldCom, Xerox, Hold Royal, or Equitable Life bankruptcies are few examples which are a matter of interest to the researchers in context of creative accounting. In spite of serious issues in the lives of organizations, however, it is not possible to eliminate creative accounting completely. Managers use creative accounting in depreciation methods, in the lives of assets, in salvage values, which are a source of manipulation in earnings of the organizations and ripple effects come to dividend yield. Managers have their own roles to show fluctuating profits and investors get a different snapshot of the financial statements. To exclude creative accounting from balance sheet auditors and management have to play a big role and provide true & fair view in financial reporting. Financial Managers have certain expertise to give life to numbers. Shah, Butt, and Tariq, (2011) tried to give answer that why do managers practice creative accounting and how do they become successful in performing such malpractices in the presence of stringent rules and procedures. They made an extensive research and explore whether the practice of creative accounting is good or bring misfortune for an organization. History tells, companies like Enron has shown higher profit than actual and finally collapsed. At this stage, the role of corporate governance comes in force. It can play an effective role to reduce the risks and can support professional accountants to show a true and fair view of financial reporting. According to some researchers, creative accounting is nothing but a creative disclosure. Mati, Vlada and Cazudriorean (2012) have the same judgments related to creative accounting. According to a recent research Yadav (2014) stated that the information is divided into two types: (i) Verbal information and (ii) numerical information. He claimed that manipulations connected to presentation of financial information certain strategies, which includes:

- Using creative accounting in a manner to make the text difficult to read;
- Using persuasive language that comprises only positive words and emphasizes positive financial performance;
- Using creative accounting visual manipulation in the way information is presented with the scope of attracting the attention from other items those are important but in the same time are not flattering to the financial performance presented.

Hameed (2014) described the importance of financial reporting as “The application and practice of proper international financial reporting standards is more relevant issue for good corporate management in the present competitive age as these applications maintain respectable status of a company in corporate world”. It means the professional accounting does not appreciate the practice of creative accounting.

5. RESEARCH METHODOLOGY

Numbers are important since the birth of this world and creative accounting is a game of number. Professional accountants support their firms in playing the number games in creative accounting. In this global village all commercial organizations try to use window dressing and want to apply the technique of creative accounting to show an enhanced earning. Not only the team of professional accountants but also the management associated to corporate governance also shows their interest in creative accounting techniques. In large organizations there are number of elements which effect the financial statements and reporting styles and this effect is a result of creative accounting practices in an organization. I have used a global approach and use deductive research to know the opinions of professional accountants, accounting academicians and accounting consultants regarding certain factors of corporate governance related to its impact on creative accounting and vice versa. The main purpose of my research is to test the existence and relation between practices of creative accounting and concepts of corporate governance.

5.1 Research Objectives

In today’s unpredictable world we talk in different domains, including research “ keep your fingers crossed”, so the same phenomena is applied to creative accounting as it is considered as bliss or curse. On one hand there are numerous companies who take creative accounting as ethical on the other several take it as unethical. The objective of this research is to explore to find out as is it a corporate dilemma or matter of choice.

5.2 Specific dual strategy towards Methodology

My methodology towards this research was based on a dual strategic plan to provide a solid set of conclusions and recommendation. I supported my research methodology by a desk research “A brief review of creative accounting literature and its consequences in practice” by Balaciu Victoria and Bogdan, which is a great piece of art for an analysis of academic articles, available in specific scientific databases; Science Direct, Emerlad and ProQuest, as it was further adopted by different researchers. Further, The most important resource in my research methodology was a background research, titled “Creative Accounting: An Empirical Study from professional Prospective” by
Yadav(2014) a senior researcher and academician from India, which I study from all aspects to find out certain facts related to creative accounting. Finally, I closely observed a connection between creative accounting and different factors of corporate governance and focused at this area to improve the discussion related to creative accounting and impart the knowledge. In this connection I had personal meetings and interviews, surveys and analysis. A questionnaire, having six questions was based on a secondary research is included in this paper.

5.2 Design of the Questionnaire

The main design of the questionnaire is created to get a point of view from academicians and financial managers and objective is to find out the relation between creative accounting techniques and factors associated with corporate governance. These questions were given to accounting specialists in certain areas of work, associated with creative accounting. The six tested assumptions are important part of this research paper, which provides a sound solution and findings towards this research. The under mentioned six hypotheses show different relations of creative accounting towards important factors of an organization. Basically, these questions discuss creative accounting techniques and its relationship to check the positive, negative or no relations phenomenon in the life of an entity. These assumptions are here under: **Yaday has provided the same relationship in his research.**

H0= there is a relationship between creative accounting and capital market techniques
H0= there is a relationship between creative accounting and Involvement of outside directors
H0= there is a relationship between creative accounting and Goodwill of the firm
H0= there is a relationship between creative accounting and internal control mechanism
H0= there is a relationship between creative accounting and Audit Standards
H0= there is a relationship between creative accounting and product and market conditions

5.3 Findings of Research Questions

**Research Question 1:** Is there a relationship between creative accounting and capital market techniques?

**Findings:** On the basis of interviews and discussions, it was found that there is no relationship between Capital Market Techniques and Creative Accounting. It shows that the financial structure of an organization gets an impact of creative accounting in terms of debt to equity ratios. Further, it confirms that financial gearing does not take any impact of creative accounting under materiality.

**Research Question 2:** Is there a relationship between creative accounting and Involvement of outside directors?

**Findings:** Discussions with financial professionals made it clear that creative accounting has an inverse relationship in positive way towards involvement of outside directors. The research confirms that when the organization has more of internal directors as well as external directors and when their shareholdings are more in the company, then the managers always try to reduce creative accounting. The survey provided a result as if the company involves more of directors in their decision making; less of creative accounting is practiced.

**Research Question 3:** Is there a relationship between creative accounting and Goodwill of the firm?

**Findings:** In today’s competitive world of businesses, mergers, acquisitions and consolidations have enormous amount to impact towards financial reporting. IFRS 10 provides clear guidance in this connection; however, here one does not find any role of creative accounting. Goodwill is considered as one of the important factor of corporate governance. Brand and image of a firm play significant role to improve the profitability and liquidity of the organization. However, it is a clear judgment by professional accountants and accounting academicians that creative accounting has a strength to attract shareholders, so they can find a value addition in their wealth.

**Research Question 4:** Is there a relationship between creative accounting and internal control mechanism?

**Findings:** Internal control is an important factor of corporate governance. Responses gave a clear indication that there is a positive relationship between creative accounting and control mechanism.

**Research Question 5:** Is there a relationship between creative accounting and Audit Standards?

**Findings:** A detailed discussion with professional auditors associated with 4 BIGS, made it clear that there is a positive relationship between creative accounting and audit standards. It means, if an organization follows fair practices for its financial reporting under right guidance of audit standards, in result creative accounting will have immaterial values.

**Research Question 6:** Is there a relationship between creative accounting and product and market conditions?

**Findings:** A firm’s competitiveness plays a vital role to improve its market share. On the basis of discussion, interviews and surveys it becomes clear that there is no relation between techniques of creative accounting and product & market conditions.
6. CONCLUSIONS

On the basis of all above findings it is correct to say that creative accounting and corporate governance has a positive relationship. Financial Managers always try to increase earnings before interest and tax of the entity and if the there is a congenial partnership between share holders and stewards of the organization then a win-win situation appears. The profit and liquidity of the firm do not give benefits only to management but also add value to the shareholder’s wealth in terms of high dividends and improvement in their capital gain. In today’s competitive world, one cannot ignore the importance of assurance and audit. Audit standards bind the organization to have ethical practices for the benefits of all stakeholders and thus play its positive role in creative accounting to cut down it by financial managers. It is also a truth that direct involvement of directors is essential to reduce the practices of creative accounting. If there are sufficient number of meetings meeting held by the external directors it may bring reverse impact on creative accounting and minimum practices of creative accounting.

7. RECOMMENDATIONS

Financial reporting plays a significant role to enhance the confidence and faith of the investors and other stakeholders, who are interested to find out the performance, position and cash flow position of the organizations and it is directly associated to the corporate governance of an organizations. There should be a very sound understanding between the stewards, known as management and owners who are the shareholders of the organization, otherwise a divorce to management to ownership or vice versa, directs fate of organization towards a failure. It is vital to improve trust of investors for success of an organization and to achieve this objective, quality of financial reporting is essential and it is recommended that there should be a sound harmony among the professionals in financial affairs and corporate governance, so get desired profits without taking any support of techniques of creative accounting. It is very important to understand that fair and true view of financial recording and financial reporting is closely associated with ethical standards of assurance and auditors, so it is recommended that audit assignment should be handover to reliable third party, knowledgeable and competent auditors, who can protect benefits of all stakeholders with justice and wisdom. It is also a recommendation on the basis of true observations that regularities bodies should make those regulations, which have strict rules for financial professionals to understand real essence of different techniques of creative accounting. Finally, as it is difficult to reduce the practice of creative accounting in the world of finance, as it has strong involvement of financial managers and auditors who know very well that how to create window dressing by financial reporting in books of accounts, so not only a strong ethical code of corporate governance is required but also a new international financial reporting standard must come in force for proper guidance of professional accountants and academicians associated with accounting and finance to understand all aspects of creative accounting. It is also important to note at this point of time, that there is an open opportunity towards valuable research in creative accounting for the benefit of societies, around the globe to support a new international financial reporting standard.

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TECHNO-LITERATES TO INFO-LITERATES: ENHANCING LEARNING THROUGH INFORMATION LITERACY

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ABSTRACT

The Indian Institutes of Technology (IITs) are a group of autonomous public engineering institutes of India governed by the Institutes of Technology Act, 1961 which has declared them as “institutions of national importance”. IITs are centres of excellence and innovation. They have been established with a vision to promote quality scientific and technical education in the country. They aim to serve as a valuable resource for industry and society producing techno-literate who can compete and survive in the global market. To achieve these objectives it is essential that students of IITs are aware info-literate. Information literacy (IL) provides the ability to locate, process and use information effectively. It teaches intellectual abilities of reasoning and critical thinking thus helping the students in problem-solving and decision making. IL prepares the students to not only survive in the competitive environment of today’s information age but also develops them into life-long learners. The present study is a survey to assess the status of Information Literacy Programme (ILPs) in libraries of IITs. It also attempts to understand the problems faced by the libraries in the implementation of ILP and suggest ways to overcome the same. Questionnaire as a tool has been used for data collection and the data thus collected has been tabulated and analysed using statistical techniques to draw the inferences. The study is of significance to IITs in particular and other technical institutions in general. The study shows that most of the libraries do conduct ILP but much needs to be done to implement it effectively. IITs need to realize the importance of IL and at the same time libraries need to play a proactive role in this regard. A list of recommendations, based on the findings and inferences, have been provided to develop our techno-literate into info-literate to realize the vision of Digital India.

Keywords: Information Literacy, Information Literacy Programs, Information Competency, Info-literate, Indian Institute of Technology

1. INTRODUCTION

We are today living in an Information Society; a society which is characterized by use of technology. It is also a dynamic society where technology changes over night. So in order to grow, a nation will have to keep pace with the changing technology. We need to focus on keeping our technocrats up-to-date. Life-long learning is the need of the hour and “learn to learn” is the only solution. Technocrats will have to regularly update and upgrade their skills to survive the cut-throat competition. So, life-long learning is a necessity. Lifelong learning is the lifelong, voluntary and self-motivated pursuit of knowledge for either personal or professional reasons. As such, it not only enhances social inclusion, active citizenship and personal development but also competitiveness and employability (Wikipedia, para. 1).

Information literacy (IL) forms the basis for life-long learning. It enables the learners to master content and extend their aims to develop both critical understanding and active participation. It enables students to interpret and make informed judgments as users of information sources; but it also enables them to become producers of information in their own right, and thereby to become more powerful participants in the society (Pejova, Zdraviska, 2002). India has set up 16 Indian Institutes of Technology (IITs), a group of autonomous public engineering institutes, as "Institutions of National Importance". IITs are centres of excellence and innovation. They have been established with a vision to promote quality scientific and technical education in the country. They aim to serve as a valuable resource for industry and society producing techno-literate who can compete and survive in the global market. To achieve these objectives it is essential that students of IITs are aware info-literates.

2. LITERATURE REVIEW

Importance of IL has been realized and accepted worldwide. IL is described in the Alexandria Proclamation of 2005, as essential for individuals to achieve personal, social, occupational and educational goals. Information literacy skills are necessary for people to be effective lifelong learners and to contribute in knowledge societies. Also, IL was endorsed by UNESCO’s Information for All Program (IFAP) as a basic human right (Catts and Lau, 2008, p. 7).

To promote IL and effectively execute Information Literacy Programs (ILPs), IL standards and models have been developed by many institutions like ALA’s Library Instruction Round Table (LIRT), ACRL’s Instruction Section,
Australian and New Zealand Institute for IL (ANZIIL), IFLA IL Section, etc. IL Standards in Science and Engineering/Technology have been especially designed to assess the information competency of science and engineering students. It is based on the ACRL IL Competency Standards for Higher Education and comprises of five standards and twenty-five performance indicators. The standard lays down performance indicators and their outcomes for assessing progress toward IL. It is an important tool for designing ILP for engineering students. (http://www.ala.org/acrl/standards/infolitscitech).

Over the years many studies have been conducted on IL and these studies reinforce the need for IL in higher education and the importance of ILPs for students. In 2001, the Institute of Social Studies (Sozialforschungsstelle) in Dortmund published the alarming results of an official investigation into students’ abilities to deal with electronic sources, stating that these abilities were insufficient and deserving further advancement (Orde and Wein, 2009). Pawinun, Nyamboga and Kemaparaju (2001) studied the issues of information technology and higher educational development and the advances of the digital library in Thailand and Kenya. They have stressed on the need for information literacy and opine that the context of information literacy is of a wide range consisting of the traditional library literacy, the basic computer and telecommunication literacy, etc. and so information literacy programme should have different sections and should be provided through different methods. The California State University information literacy assessment studies conducted in 2000 and 2001 show an over reliance on Web based information resources. It also shows that students generally search using keywords rather than controlled vocabulary terms which may many times lead to irrelevant retrievals (California State University, 2002). Kumar and Kumar (2005) also opine that students today have picked up the skills to send e-mail, chat and download music but have not learnt how to effectively locate information, evaluate, synthesize and integrate ideas; use information or give proper credit for information used. A study by Ali, Abu-Hassan, Md Daud and Jusoff’s (2010) to assess information skills of engineering students also shows that students lack necessary knowledge and skills to evaluate Internet information. They emphasize on information literacy assessment of the students as the first step to improve their information competencies. Wartz, Roll,Purzer, Fosmire and Cardella (2011) assessed the IL skills of 366 first-year engineering students. Their study shows that improvement is required in the IL skills of engineering students to become competent lifelong learners. Kehoe(1993) had rightly said, “Access to vast amount of information is not the whole answer. The power to discover the right information quickly and easily, to separate nice to know from need to know information is essential, if superhighway users do not drown in electronic junk information. An information flood does not necessarily mean that people become informed.”

Libraries have always played a pivotal role in human progress by preserving and serving knowledge and information across frontiers. But unfortunately, as correctly stated by Singh and Dilara Begum (2012), the students of today rely more on Internet then on libraries for their information needs. They think Google has answers to all their questions. But this is not true. IL is a skill that has to be taught. Breivik (2005) emphasizes on implementation of Information Literacy to teach students critical thinking skills that will help them determine when and where to find information and how to identify, access, evaluate and effectively use that information. Vezzosi’s (2008) study shows that an ILP conducted in phases can lead to visible changes in terms of knowledge and skills and a development towards independence and critical awareness among students. Zhao and Rabbat (2013) suggest that an effective ILP can be designed and implemented by collaborative efforts of faculty and librarians. They also opine that IL training is a process and so it is effective when delivered in a phased-out manner instead of a one-shot program.

3. METHODOLOGY
3.1 Objective and Scope of the study
The objective is to study the ILPs being conducted by the libraries in IITs. It will help us to understand the problems faced by the libraries in the implementation of information literacy programs and suggest ways to overcome the same. There are 16 IITs in India under the governance of Ministry of Human Resource and Development. All the libraries of 16 IITs have been taken under the scope of study.

3.2 Research Method
The study is a survey research. Data collection was done with the help of a structured questionnaire administered to all the libraries of 16 IITs under the scope of study. The data collected was than tabulated and analysed to draw the inferences.

3.3 Data Analysis
The questionnaire was sent to the librarians of 16 libraries under the scope of study to collect information on the ILP being conducted by these libraries. The response by the respondents has been tabulated in the tables given below: Table 1 shows that ILP is conducted by 12 (75%) libraries and 01 (06.25%) does not conduct ILP. In spite of the best efforts response could not be received from 03 (18.75%) libraries. The data thus collected from 12 libraries has been tabulated in the tables given below to assess the status of ILPs in libraries of IITs.
Table 1. Number of respondents

<table>
<thead>
<tr>
<th>Information Literacy Programme</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted</td>
<td>12 (75.00%)</td>
</tr>
<tr>
<td>Not Conducted</td>
<td>1 (06.25%)</td>
</tr>
<tr>
<td>No Response</td>
<td>3 (18.75%)</td>
</tr>
<tr>
<td>Total</td>
<td>16 (100%)</td>
</tr>
</tbody>
</table>

Table 2. Budget Allocation for Information Literacy Programme

<table>
<thead>
<tr>
<th>Budget Allocation for ILP</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>2 (16.67%)</td>
</tr>
<tr>
<td>Not Available</td>
<td>9 (75.00%)</td>
</tr>
<tr>
<td>No Response</td>
<td>1 (08.33%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
</tr>
</tbody>
</table>

Out of the 12 libraries, 9 (75.00%) do not have a separate budget allocation for ILP and only 02 (16.67%) libraries have separate budget allocation. One library did not respond to the question.

Table 3. Instructors for Information Literacy Programme

<table>
<thead>
<tr>
<th>Training by</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Library Staff</td>
<td>7 (58.33%)</td>
</tr>
<tr>
<td>Only Academic Staff</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Only Staff of e-publishers</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Both Library Staff and Academic Staff</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Both Library Staff and Staff of e-publishers</td>
<td>3 (25.00%)</td>
</tr>
<tr>
<td>Library Staff, Academic and Staff of e-publishers</td>
<td>2 (16.67%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
</tr>
</tbody>
</table>

Table 3 shows that ILP is conducted independently by the library staff in 7 (58.33%) IIT libraries. Only 3 (25.00%) libraries conduct ILP by both library staff and staff of e-publishers whereas only 02 (16.67%) libraries conduct ILP by Library Staff, Academic Staff and Staff of e-publishers.

Table 4. Compulsory Information Literacy Programme

<table>
<thead>
<tr>
<th>Information Literacy Programme</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory</td>
<td>1 (8.33%)</td>
</tr>
<tr>
<td>Not Compulsory</td>
<td>11 (91.67%)</td>
</tr>
<tr>
<td>No Response</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
</tr>
</tbody>
</table>

Table 4 shows that ILP is not compulsory in 11 (91.67%) libraries. Only 01 (8.33%) library has made ILP compulsory for students and research scholars.

Table 5. Integration of Information Literacy Programme in the Curriculum

<table>
<thead>
<tr>
<th>Information Literacy Programme</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated as part of Curriculum</td>
<td>1 (8.33%)</td>
</tr>
<tr>
<td>Not Integrated as part of Curriculum</td>
<td>10 (83.34%)</td>
</tr>
<tr>
<td>No Response</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
</tr>
</tbody>
</table>

The above table shows that 10 (83.34%) libraries have not integrated ILP in the curriculum. Only 01 (8.33%) library has integrated ILP in the curriculum. One 1 (8.33%) library did not respond to the question.

Table 6. Assessment of User Needs

<table>
<thead>
<tr>
<th>User Needs</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed</td>
<td>8 (66.67%)</td>
</tr>
<tr>
<td>Not Assessed</td>
<td>4 (33.33%)</td>
</tr>
<tr>
<td>No Response</td>
<td>0 (00.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100.00%)</td>
</tr>
</tbody>
</table>
Table 6 shows that 8(66.67%) libraries assess user requirements before implementation of ILP while 4(33.33%) libraries do not assess user requirements.

Table 6.1 Method of assessment

<table>
<thead>
<tr>
<th>Method of Assessment</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>By User Survey through Questionnaire</td>
<td>1(12.50%)</td>
</tr>
<tr>
<td>By Analysing Library Records</td>
<td>2(25.00%)</td>
</tr>
<tr>
<td>By Observation</td>
<td>2(25.00%)</td>
</tr>
<tr>
<td>By On-line Assessment</td>
<td>0(0.00%)</td>
</tr>
<tr>
<td>By Questionnaire and Analysing Library Records</td>
<td>1(12.50%)</td>
</tr>
<tr>
<td>By Analysing Library Records and Observation</td>
<td>2(25.00%)</td>
</tr>
<tr>
<td>No Response</td>
<td>0(0.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>8(100%)</td>
</tr>
</tbody>
</table>

Table 6.1 shows that, out of the 8 libraries that assess user needs before imparting ILP, 1(12.5%) library uses User Survey through Questionnaire; 2(25.00%) use Analysing Library Records; and 2(25.00%) use Observation method to assess user requirement. 1(12.5%) use both Questionnaire and Analysing Library Records. Questionnaire, Analysing Library Records and Observation, all three methods are used by 02 (25.00%) libraries. On-line Assessment method is not used by any library.

Table 7. Adoption of IL Standards/Models

<table>
<thead>
<tr>
<th>IL Standards/Models</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopted</td>
<td>1(8.33%)</td>
</tr>
<tr>
<td>Not Adopted</td>
<td>9(75.00%)</td>
</tr>
<tr>
<td>No Response</td>
<td>2(16.67%)</td>
</tr>
<tr>
<td>Total</td>
<td>12(100%)</td>
</tr>
</tbody>
</table>

IL Standards and Models are not adopted by 9(75.00%) libraries. Only 1(8.33%) library claimed to use IL standards/models but did not mention which standard/model is being used by them. Two libraries 2(16.67%) did not respond to the questionnaire.

Table 8. Separate Section/Staff for Information Literacy Programme

<table>
<thead>
<tr>
<th>Information Literacy Programme</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate Section/Staff</td>
<td>0 (0.00%)</td>
</tr>
<tr>
<td>No Separate Section/Staff</td>
<td>12 (100%)</td>
</tr>
<tr>
<td>No Response</td>
<td>0(0.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
</tr>
</tbody>
</table>

There is no separate section/staff to conduct ILP in all the 12 (100%) libraries.

Table 9. Evaluation of Information Literacy Programme

<table>
<thead>
<tr>
<th>Information Literacy Programme</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluated</td>
<td>3(25.00%)</td>
</tr>
<tr>
<td>Not Evaluated</td>
<td>6(50.00%)</td>
</tr>
<tr>
<td>No Response</td>
<td>3(25.00%)</td>
</tr>
<tr>
<td>Total</td>
<td>12(100%)</td>
</tr>
</tbody>
</table>

Table 9 shows that ILP is evaluated in only 03 (25.00%) libraries after implementation. Six 06 (50.00%) libraries do not evaluate the ILP and three libraries 03(25.00%) did not respond to the question.

Table 10. Constraints in Implementation of ILP

<table>
<thead>
<tr>
<th>Constraints</th>
<th>No. of Libraries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Staff</td>
<td>8</td>
</tr>
<tr>
<td>Lack of trained staff for the purpose</td>
<td>6</td>
</tr>
<tr>
<td>Lack of enthusiasm in the staff</td>
<td>2</td>
</tr>
<tr>
<td>Lack of finance</td>
<td>2</td>
</tr>
<tr>
<td>Lack of administrative support</td>
<td>2</td>
</tr>
<tr>
<td>Lack of Policy in this regard</td>
<td>5</td>
</tr>
<tr>
<td>Need for Information Literacy Programme not felt by users</td>
<td>2</td>
</tr>
</tbody>
</table>
It is evident from the above table that Lack of Staff (08 libraries) and Lack of trained staff for the purpose (06 libraries) are two major constraint for implementation of ILP followed by Lack of Policy in this regard (05 libraries).

4. FINDINGS AND SUGGESTIONS

4.1 Table 1 shows that out of the 12 IIT libraries that conduct ILP, most of the libraries (09,75.00%) do not have a separate budget allocation for the ILP. Table 10 shows that libraries (05) feel there is a lack of policy with regard to the implementation of ILP and this also could be a reason for no separate budget allocation for ILP. It is suggested that librarians should play a proactive role in promoting IL so that the importance of ILP is realized by the administration, faculty and students. This will help in formulating a policy for ILPs and allocation of budget for the same.

4.2 Table 3 shows that in majority of libraries (7, 58.33%) ILP is conducted independently by the Library Staff. Involvement of academic staff is seen in only 02 (16.67%) libraries which conduct ILP by Library Staff, Academic Staff and Staff of e-publishers. This shows that there is a lack of collaboration between library staff and the faculty members. It is suggested that faculty members should be involved in the designing, promotion and implementation of ILP leading to a more user-centric and effective ILP.

4.3 It is clear from table 4 and 5 that ILP is not given importance as it is compulsory for students and research scholars and integrated into the curriculum in only 01 (8.33%) library. IL is the need of the hour and so should be made mandatory for the students by integrating it into the curriculum.

4.4 Table 6 shows that user needs are assessed by 8 (66.67%) libraries before the implementation of ILP. Out of these 8 only 2 libraries use questionnaire to assess user needs. It is suggested that libraries should lay emphasis on assessing user needs through direct methods like questionnaire. On-line assessment methods should be also be used. A combination of direct and indirect methods of assessment of user needs will help to better customize ILP according to user needs.

4.5 It is clear from Table 7 that most of the libraries do not follow any IL standard/model (10, 58.82%). One library (8.33%) has claimed to follow IL standard/model but has not mentioned which IL standard/model they are following. Two libraries (16.67%) did not respond to the question. It would be beneficial if libraries follow one of the international IL standard/model proposed by ALA, IFLA, etc.

4.6 Table 8 shows that none of the libraries have separate section/staff to conduct ILP. Proper implementation of ILP requires separate staff which is trained for the purpose and is able to devote time for designing, implementation and evaluation of ILP. Also, Table 10 shows that out of 12 libraries, 8 libraries feel Lack of Staff and 6 libraries feel Lack of ILP Trained Staff is a constraint in the implementation of ILP. It is suggested that libraries should develop a separate IL section with trained staff to conduct ILPs.

4.7 Table 9 shows that only half the libraries, i.e., 6 (50%) evaluate their ILP after implementation. Evaluation is a must to be aware of the short comings in any programme. So in order to make ILP according to user requirement evaluation of the programme should mandatorily be done.

4.8 The major constraints faced by the libraries in implementing ILP are Lack of Staff (08 libraries), Lack of Trained Staff (06 libraries) and Lack of Policy (05 libraries). Active promotion of IL will help increase awareness and the benefits of ILP among the administration, faculty and students and this could lead to removal of the above mentioned constraints.

5. DO TECHNOCRATS NEED INFORMATION LITERACY?

It was seen, from the response to the questionnaire, that in two IIT libraries users did not feel the need for information literacy and also one of the respondents said that ILP is not conducted in their library because users are tech savvy and do not need IL. Keeping these facts in mind, it is imperative to quote what US National Commission on Library and Information Science, 2003 has said - “IL encompasses knowledge of one’s information concerns and needs, and the ability to identify, locate, evaluate, organize and effectively create, use and communicate information to address issues or problems at hand; it is a pre-requisite for participating effectively in the information society, and is part of the basic human right of life-long learning” (Web and Powis, 2004, p. 7-8). Students of IIT will no doubt be tech savvy but digital literacy is not IL. It is only a part of IL. IL is an amalgamation of different literacy like library literacy, media literacy, research literacy, critical thinking, numeric and visual literacy, etc. According to Lau (2006), the Chairman of the Information Literacy Section of IFLA, IL comprises of many information competencies and development of all these competencies only can help a student to become effective learner. It would also be both important and useful to list the suggestions given by the respondents. They are of the opinion that for efficient and optimal use of the resources, adopting a policy to implement ILP is essential. Respondents also feel that IL training should be a priority on the agenda of higher education institution and IL needs to be integrated into the curriculum. It is also suggested that ILP needs to be customized according to the group of users and to be effective it should be audio-visual based.
is also opined that involving student representatives in library services could motivate users and help in promotion of IL.

6. CONCLUSION
India is a fast growing economy with a large percentage of youth and we are steadily moving towards a complete technology based Information Society. A society based on efficient processing and utilization of information with the help of technology. Now is the time to realize that we need to develop our techno-literate youths into info-literate youths. Much needs to be done to promote IL. We need to understand that IL is the key to realize our vision of Digital India. A national policy on IL will ensure effective implementation of ILP in the country. The libraries and librarians also need to come forward and play an active role in training the tech savvy youth to be responsible info-literates. IL will not only lead to optimum utilization of huge information resources that we are creating and maintaining but also develop lifelong learners. Lifelong learning will help our youth to become more aware and sensitive citizens; and play a proactive role in the society leading to the socio-economic development of our country.

REFERENCES
E-CONTENT INITIATIVES OF MHRD, INDIA: A STUDY

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ABSTRACT

The Ministry of Human Resource Development (MHRD), India is playing a significant and remedial role in balancing the socio-economic fabric of the Country. The ministry believes that citizens are the most valuable resource, and thus they need to be nurtured and cared in the form of basic education to achieve a better quality of life. The MHRDs one of the main objective is to plan, develop, including expand the access and improve quality of the educational institutions throughout the country, including in the regions where people do not have easy access to education. The Ministry is also encouraging international collaboration in the field of education, and is working with the UNESCO and governments of various other countries as well as Universities worldwide, to boost the educational opportunities in India.

This paper will study the various e-initiatives taken in over last few years and numerous platforms created with objectives to provide the e-content to the citizens of India. The paper will study the initiatives like National programme on Technology enhanced learning which aims to provide e-learning through online Web based and Video based courses in the stream of Sciences, humanities and Engineering. The study also provides overview to remote-access Labs initiatives created in various disciplines of Engineering and Sciences. The Virtual Labs helps and provide the content to the students at the undergraduate level, post graduate level as well as to research scholars. The numerous other projects under study with its details and output delivered at present will include Talk to Teacher, Spoken Tutorials, e-Yantra, FOSSEE (Free and Open Source Software for Education etc.

The paper will also detail about the project developed for automatic Indian Sign Language education and recognition. Similarly another important project called e-kalpa dedicated to creating Digital Learning Environment for Design in India will be studied. This project involves providing digital online content, a social networking environment and digital resource database on design.

1. INTRODUCTION

Government of India (GOI) is committed to implement National e-governance plans and under this the Indian Government envisages that all services should be available to the common man in his vicinity, through regular service delivery channel. The GOI is committed to ensure efficiency, transparency, precision and trustworthiness of such services at reasonable costs to realise the basic, fundamental and viral needs of the common man in India. It is evident that India is marching quickly towards an ambitious determined agenda of social and economic advancement with e-governance. (Kumar, 2009) Ministry of Human Resource and Development (MHRD) of India has the objective to have planned development for the educational institutions, which includes expansion of the access and quality improvement throughout the country. The government is more focused on the regional areas where citizens do not have easy access to the regular education. MHRD is making use of potential and powerful Information Communication Technology such as open access resource, satellite based technologies, local language interfaces, human-computer based interfaces, digital and virtual libraries, etc. with a long-term planning to reach the farthest and remotest part of the villages, district and localities. (Bhattacharya and Sharma, 2007) It is committed to provide the special attention and consideration to disadvantaged and underprivileged groups like the deprived, poor, gender based- women and the minorities classes. For this GOI is also persuading international cooperation and is also working directly with the UNESCO and governments internationally to boost the educational opportunities in the country. The government is committed towards promoting various e-content initiatives in India. It is opening multiple and numerous platforms and decentralising the process, so that the benefits can be achieved to the masses. (MHRD-India, 2015)

2. E-CONTENT INITIATIVES IN INDIA

a. National Programme on Technology Enhanced Learning (NPTEL) is an initiative taken by seven intuitions in India. These institutions includes Indian Institutes of Technology (IIT Delhi, Bombay, Madras, Roorkee, Kharagpur Guwahati and Kanpur) and Indian Institute of Science (IISc). Under the NPTEL the seven institutions are creating course contents in the discipline of sciences and engineering. The programmes was originated with the thought provoking discussions and deliberations during the years 1999 to 2003 between various Indian Institutes of
Technology and Indian Institutes of Management (IIMs) and Carnegie Mellon University (CMU). At present the programme NPTEL has developed curriculum based course contents relating to more than 240 engineering courses in major five disciplines at the undergraduate level. It includes the Contents based on the model curriculum suggested by AICTE i.e. All India Council for Technical Education and the syllabus of major affiliated Universities in India. It is largest repository of courses in Humanities and Engineering Science from India's best premier institutes. The portal provides the NPTEL Online Courses, its Local Chapters, Speech to Text Option, GATE preparation and Workshop links. It is contributed by more than 200 faculty members from all associated Institutions having approx 5,000 one hour video lectures out of which 3500 hours have been uploaded. (NPTEL, 2015)

Source: http://nptel.ac.in/

b. Virtual Labs- Virtual Labs is an initiative of Government of India, MHRD under the NMEICT- National Mission on Education through ICT to provide the students with the result of experimentation, testing by modelling the physical phenomenon by a series and set of equations. The Virtual Labs carry out simulations and recreations to yield the result of the particular experiment. It also provides series of measured data derived from the virtual lab experiments corresponding to the data previously obtained by measurements the actual systems. It also remotely helps trigger an experiment in an actual lab and provides student the result of the experiment through the computer/machine interface. This helps the students in carrying out the actual lab experiment remotely with less difficulty. The Virtual labs provide a comprehensive LMS-Learning Management System where the learners can avail the various means for learning, including web based resources, video based lectures, animations, expressions in various formats and self evaluation. The IITs and universities are the participating institutions and contributing to the virtual labs. (Vlab, 2015)

Source: http://www.vlab.co.in/

c. Talk to the Teacher: This program is taken up and coordinated by Indian Institute of Technology -Bombay and is funded by the Ministry of Human Resource Development (MHRD) under the NMEICT -National Mission for Education using Information and Communication Technology. The project is named as Amrita Virtual Interactive e-Learning World (A-VIEW) is indigenously built multi-modal and has an multimedia e-learning platform. It provides an in-depth e-learning experience that is simulates an real classroom experience. The platform works on real-time basis through live audio-video streaming and synchronized content sharing. The teacher or instructor can teach and interact with number of students and learners excelling the geographical boundaries. (Aview, 2015).
d. **Spoken Tutorial**: The Spoken Tutorial project is related to educating and learning some of the Free and Open Source Software (FOSS) namely Linux OS, Scilab, PERL, Apache, LaTeX, PHP & MySQL, Java, C/C++, Libre Office, Moodle etc. through the simple Video based tools. It is an initiative of NMEICT - National Mission on Education through ICT, MHRD and promote IT literacy through teaching of Open Source based Software. At present there are more than 630 spoken original tutorials, designed in English language and dubbed in 22 languages.

Source: http://spoken-tutorial.org/

e. **Consortium for Educational Communication (CEC)**- CEC, as a dynamic partner, is engaged in creation and production of electronic content courseware for bachelor degree under-graduate subjects under the NME-ICT plan project of MHRD. The project provides significant, vital opportunities for all the faculty, teachers and subject experts in the country to team up and pool their collective knowledge for the benefit of Indian learner community and further reduce the digital divide. The Inter University Centres set up by the UGC- University Grants Commission, India further addresses the needs and requirements of Higher Education through the use of influential medium of Television alongwith non less potential medium of Information Communication Technology (ICT). The Consortium for Educational Communication includes the electronic based education, Media Centres, Multimedia Research Centres, Vyys higher Education Channel - known as Vyys and various other Electronic knowledge oriented resources. (CEIC, 2015)

Source: http://cec.nic.in/Pages/Home.aspx

f. **e-Yantra**- e-Yantra is also an Ministry of Human Resource Development sponsored project under the NME-ICT which incorporates Robotics into engineering education. e-Yantra engage students, colleges and faculty through hands on application in mathematics, computer science and engineering science principles. It is initiated by IIT Bombay, to harness the brain of young generation Indian intellectuals and create utility based robotic applications
and enhance the innovations in the country. The platform includes three major components, these are eYRC i.e. e-Yantra Robotics Competition (eYRC), eLISI i.e. e-Yantra Lab Setup Initiative and eYS i.e. e-Yantra Symposium. (e-Yantra, 2015)

Source: http://e-yantra.org/

**g. e-PG Pathshala**- The project is assigned to University Grant Commission develops electronic content in 71 major subjects at master degree level i.e. postgraduate level. It provides quality based, course curriculum based, interactive content in 69 subjects, presently having 840+ papers with 5400+ e-text modules, 1600+ videos, 20,000+ quizzes from 4000+ experts across the major disciplines of Social Sciences, Humanities, Natural Sciences, Mathematical Sciences, Linguistics & Languages, Arts and Fine Arts. (e-PG Pathshala, 2015)

Source: http://epgp.inflibnet.ac.in/about.php

**h. UGC-INFONET Digital Library Consortium**- UGC-Infonet Digital Library Consortium was started in December, 2003 and it provides access to current and archives of more than 7500+ peer-reviewed core journals. The consortium also provides access to more than 10 bibliographic databases. The wide range of resources is covered from nearly 26 publishers and aggregators in different disciplines and subjects. The UGC Infonet access is provided to 209 Universities including 14 National Law schools and central universities that come under the scope of UGC, India. (INFONET, 2015)

Source: http://www.inflibnet.ac.in/econ/

**i. Quantum & Nano Computing Centre** - The Quantum-Nano Computing is a multi-disciplinary centre at Dayalbagh Educational Institute in Agra, Uttar Pradesh, India setup under NME-ICT of MHRD, with partner institutions including IIT-Delhi, IIT-Kanpur and IIT-Madras besides several international collaborators around the
world. The collaborations in quantum and nano computing are made by theoretical physicists and computer scientists who discover achievable applications of the technical tools of quantum field and string theory. (QNCC, 2015).

j. Free and Open Source Software for Education (FOSSEE) - FOSSEE is also part of the NME-ICT of MHRD project started with the variation and use of open-source simulation model in association with IIT, Bombay. FOSSEE motivates students, faculty and other users to use open-source software and application software instead of proprietary software and applications. The platform includes projects like DWSIM which is an open source CAPE-OPEN compliant chemical procedure simulator; similarly it has OSDAG (Open Source Tool for Steel Design) which is used to design steel based structures through a GUI - graphical user interface. The platform also provides SCILAB used for numerical computing and is developed by Scilab Enterprises, France and includes XCOS a graphical based editor used to design hybrid dynamical systems models. The FOSSEE platform also provides eSim (formerly known as OSCAD/FreeEDA) for designing circuits, making simulations, analysing and creating PCB design. The project provides OpenFOAM with CFD toolbox which is useful to solve complex fluid flows relating to chemical reactions, turbulence and heat transfer, solid dynamics and even electro-magnetics. FOSSEE IIT Bombay is also working on pilot project to have a low cost based laptop, known as the FOSSEE-Laptop. The laptop is affordable for the students and low weight with 10 inch GNU/ Linux with pre-installed educational applications and utilities. It also provides OR- Optimisation Tools and Simulation tools including Computational Infrastructure for Operations Research (COIN-OR), GNU Linear Programming Kit (GLPK) and others, interfaced through open sources and programme languages like Python. (FORSSEE, 2015)

k. Creating Digital-learning Environment for Design - 'e-kalpa' - The DSource project is titled as “Creating Digital Learning Environment for Design in India” (‘e-kalpa’). It provides digital content available online for learning and designing. The project is associated with distance electronic learning programs. It further designs social networking for Higher Education Learning with mutual Learning Space for the design of Synchronous & Asynchronous Interaction. It also provides resource databases for digital designing in the craft sector. (D Source, 2015).

l. Pedagogy Project – The project is started under the NME-ICT of MHRD to develop appropriate pedagogical and educational methods for various classes, intellectual calibres and learning research. Approximately 200 curriculum documents equivalent to 40x1 hour classroom lessons have been developed in various Engineering streams like Civil Engineering, Electrical Engineering and Electronics, Chemical Engineering, Mechanical Engineering, Communications Engineering and Computer Science. It is expected that the entire lessons collection will be made available in Open Educational Resource by the end March 2016 by the partner institutions including IITs and NITs. (Pedagogy, 2015)

m. SOS Tools – The project under the NME-ICT of MHRD develops software based tools for analysis of systems and computations. SOS tools uses Sum of Squares Optimization Toolbox, MATLAB for developing passable manpower to train students in using open source based software’s and build simulation tools. The tools are freely available to the users including student, teacher, faculty, institution through the Sakshat Portal. (SOS Tools, 2015)

n. Sakshat- Sakshat is a landmark initiative of Ministry of human Resource Development to deal with all the educational and learning related requirements of students, teachers, faculty and lifelong learners. It leverages power of ICT in Higher Education. It provide a single window to all the initiatives made under the NME-ICT of MHRD. It has four quadrants i.e. e-content (text with annotations), web resources, e-tutor and self-assessment. (Sakshat, 2015)

![Sakshat](http://www.sakshat.ac.in/#)

Source: http://www.sakshat.ac.in/#

o. SWAYAM-MOOCs- The Government of India has also initiated Massive Open Online Courses platform named as SWAYAM which stands for “Study Webs of Active-learning for Young Aspiring Minds”. Swayam, is a platform for Self Learning and is the Indian adaptation of MOOCs which is partnered with IITs, IIMs, and other central universities. It is expected this will bridge the gap between demand and supply of education in India. It is also planned that the MOOCs will be transformed into MOOPs i.e. Massive Open Online Programmes in near future where accredited and certified degrees will be provided. (Swayam-India, 2015).
3. CONCLUSION

According to the Prime Minister of India, “Education should become a force for the nation’s character building and good education is the foundation of new discoveries, new knowledge innovation and entrepreneurship, which trigger growth and prosperity of individual as well as that of a nation.” (MHRD-India, 2015). Indian education policy works on three fundamental principles that are Access, Equity and quality. The Government of India is committed to provide the low-cost and inexpensive access-cum-computing gadgets and devices to students, teachers and faculty. The various initiatives taken by MHRD, are to provide the top quality electronic content free of cost to all learners and students of the nation. The NME-ICT scheme of India is working towards generation and creation of maximum electronic content along with providing connectivity for access gadgets and devices for institutions and learners across the country.

REFERENCES

INVESTMENT PORTFOLIO OPTIMIZATION: A CASE STUDY OF NPPF (BHUTAN)

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ABSTRACT
In Bhutan, National Pension and Provident Fund (NPPF) is a public social security institution with the mandate to provide post-retirement income security to its members. The main function of NPPF is collection of pension and provident funds, but the collections have to be invested optimally. Its investments are in equities, bonds, fixed deposits, real estates and loans. The investments in these asset classes need to be optimized to reap the maximum return with minimal risk. The task of minimizing risk and maximizing returns can be obtained by using optimizers, for example the Mean-Variance optimization or the Markowitz optimization commonly known as Markowitz model. However, in this paper focus has been placed on efficient optimizer; the Linear Programming model. In both the models the risk aspect of the portfolio is represented by the variance or the standard deviation.

The finding of this paper indicates that investment portfolio of NPPF can be optimized. Despite limited equity markets in Bhutan, if investments in equities are increased than the investments by NPPF could optimize returns.

Keywords: portfolio, risk, optimization, returns, LP model.

1. INTRODUCTION
The NPPF is public social security institution which provides post-retirement income security to members. Although, its function is collection of pension and provident funds, collected funds have to be invested judiciously to optimize returns. It invests member contributions in cash/cash products, securities of Royal Government of Bhutan or Royal Monetary Authority, company shares, securities and other evidence of indebtedness listed on Royal Securities Exchange of Bhutan Ltd, real estate development including acquisition of building sites, residential and commercial complexes. These investment avenues are categorised as equities, bonds, fixed deposits, corporate loans, personal loans and real estate. The investments and returns on the asset classes were extracted from annual reports (2009 – 2014) of the NPPF and the portfolio returns and weights calculated (Appendix-6).

![Investments of NPPF in various Assets](image1.png)

**Figure 1:** An overview of NPPF investments in various assets from 2009 to 2014.

Equity investments included shares of Druk Punjab National Bank, Royal Insurance Corporation of Bhutan Limited, and Dagachhu Hydro Power Corporation and bonds of DPNB, RICBL, and Druk Air. Major companies such as Tashi InfoCom Ltd., Bhutan Power Corporation Ltd., Bhutan Development Bank Ltd., and some big manufacturing industries availed corporate loans. Housing, education, student and vehicle loans to members and staffs constituted of personal loans. It also invested in real estate such as housing colonies in Thimphu and Punthsholing. Lastly, it parked excess funds in fixed deposits with banks until an investment avenue is identified.

![Return on investments of NPPF](image2.png)

**Figure 2:** The returns on investments from 2009 to 2014

2. OBJECTIVE OF THE STUDY
The objective is to formulate an optimum and well diversified investment portfolio, by assigning optimum weights for each investment category for maximizing return and minimizing risk and also exploring alternatives
to bleak investment opportunities within Bhutan, i.e., authorized, certified and trusted government and corporate securities in India.

3. LITERATURE REVIEW

Management of an investment portfolio is an essential technique used to assist an individual investor or an organization to minimize risks and maximize returns. As pointed out by Chandra (2008) investment process consists of two tasks – security analysis and portfolio selection. Security analysis focuses on assessing the risk and return of the available investment alternatives while portfolio selection focuses on choosing the best possible portfolio from set of feasible portfolios.

Until 1950’s investors used intuitions to invest. However, in 1951, Harry Markowitz, an American economist developed a mathematical model called ‘portfolio choice’ which allows investors to analyze risk relative to their expected return. This led to the advent of Modern Portfolio Theory (MPT), an investment theory which attempts to maximize portfolio expected return for a given portfolio risk or minimize portfolio risk for a given level of expected return. This can be achieved by careful choosing of various assets proportions. Markowitz formalized the concept of not ‘put all your eggs in one basket’ (Jones, 2004).

According to Avadhani (2007), Markowitz Theory or Markowitz diversification is not only aimed at reducing risk of a security by reducing its variance or standard deviation, but also reducing the covariance or interactive risk of two or more securities in a portfolio. It aims to reduce standard deviation to zero and covariance in negative to settle nil overall portfolio risk. Its assumptions include investors have free access to fair and correct information on returns and risks; rational and want to maximize return with a given level of money; adverse to risk; make decisions based on expected returns and variance or standard deviations of these returns from mean; and, prefer higher returns to lower returns for a given level of risk.

The Markowitz Model uses variance to measure risk, it results in a quadratic optimization problem and as a result several alternative risk measures were also studied including Linear Programming Models.

Mansini, R., Ogryczak, W., and Speranza, M. (2003) suggested that Linear Programming (LP) solvability is very important for applications to real-life financial decisions where constructed portfolios have to meet numerous side constraints and take into account transaction costs. LP Models are more efficient compared to Markowitz Model because ‘LP solvable models themselves allow one to consider scenarios with different probabilities’ [Mansini et al (2004)]. LP is mathematical model used to represent and optimize outcome of situation. For instance, LP model can be used to optimize real world problems in mathematics, science, business and engineering. Chandrakantha (2011) has stated, LP can be used to find optimal way of using limited resources to achieve objectives of situation in aforementioned fields.

A famous algorithm called Simplex Algorithm developed by George Bernard Dantzig in 1963 is used to solve LP problems. Simplex Algorithm can solve problems of two or more dimensions and ‘algorithm’s success let vast array of specializations and generalizations that have dominated practical operations research for half a century’ (Nash, 2000). LP model has three components (Taha, 2008), namely, unknown decision variables and are determined, e.g., portfolio weights for this study; objective function of problem presented as mathematical expression in decision variables which needs to be optimized such as portfolio return and standard deviation or variance; and problem limitations are constraints expressed as equations in decision variables and solution must satisfy the constraints. For instance, investment in equities should be ≥ 30% is a constraint that needs to be taken care of while maximizing return or minimizing risk.

Chandrakantha has stated that model consisting of linear objective function and linear constraints in decision variables is called linear programming model. Taha further stated, ‘proper definition of decision variables is an essential first step in development of model and if decision variables are defined well, task of constructing objective function and constraints become more straightforward’. Mansini et al. based on experiments concluded, ‘many LP solvable models provide a more stable diversification than Markowitz model’ and ‘LP solvability is very important to real-life financial decision making where designed portfolios meet numerous side constraints and take into account transaction costs’.

Therefore, in this study, analysis of risk and return of NPPF investment portfolio were carried out using both Markowitz and LP models. However, more importance is given to LP model as it is more efficient optimizer.

4. METHODOLOGY

Nature and Collection of Data: NPPF annual reports have been accessed from Thimphu head office. It started operations from 2000 and has reports from 2000-2001, however, data from 2009 onwards are used, as it had few investments, returns were not reflected prior to 2009-2010. As a result, comparisons cannot be done without ROI.
From 2009-2010, ROI are given in detail. For instance, in 2009-10 onward reports, revenue and dividend incomes are listed in detail in schedules 13 and 14 respectively.

In addition to secondary data, primary data were also collected to understand managerial perceptions regarding investment portfolio. Information such as previous works, current projects and future plans were also discussed with its officials. All respondents from investment department Thimphu head office were directly responsible for investment activities.

**Tools and Techniques of Analysis**: Markowitz or Mean-Variance and linear programming models have been used to optimize investment portfolios for this study. However, due to Markowitz model’s limitations, suggested portfolio has been optimized using LP model. Both models can be solved using basic MS-Excel Spreadsheet and Solver advanced function. To calculate portfolio returns and optimal weights, each investment class data from 2008 to 2009 are tabulated in MS-Excel Spreadsheet and their variance and covariance are computed (Appendix-4). Basic functions of Excel Spreadsheet as well as solver advanced function are used for data analysis. Appendix-1 and Table-1.1 can also be referred to see how variance covariance matrix can be constructed in Excel Spreadsheet. The asset divisions were extracted from annual reports and each asset class was assigned weights as w1=Equities, w2=Bonds, w3=Fixed deposits, w4=Corporate loans, w5=Personal loans and w6=Real Estate. Based on investment and return from 2009 to 2014, the actual weights as well as optimized weights were determined.

The first step in analysis was calculation of returns and risks (variances). Second, mean- variance optimization (Markowitz’s portfolio model) was used to optimize the risk and return, using the solver function in MS-Excel 2013. Although the oldest investment model mean-variance optimization is robust and guaranteed to find optimal or efficient portfolio weights (Lummer, et al., 1994). Third, to further enhance optimization, LP Model was used to maximize return by considering risk as a constant. Because, LP coefficients are average- value (geometric means) of cross-asset covariance, and if standard deviations of investments and returns are sufficiently small, then approximation is acceptable (Taha, 2007). With the use of the variance-covariance matrix, data is used to calculate the weights and returns of asset classes using two methods – mean-variance (Markowitz) and linear programming models. The analysis is presented in graphical form with pie-diagrams, bar graphs and trend lines.

### 5. FINDINGS AND ANALYSIS

#### Stage 1: Optimizing Portfolio using Markowitz Optimization Model

The first model to generate optimum portfolio return (optimum weights) is Mean-Variance Optimized or Markowitz model. The objective is to find weights (w1) which minimize risk for a given portfolio return (Peterson, 2102, p.87). The first stage is to perform Markowitz Portfolio or Mean-Variance optimization is basis of portfolio optimization. The inputs needed in Markowitz optimization are complete historical data set from which geometric mean, standard deviation and correlation/co-variance matrix of assets can be calculated. From this desired output will be the set of rebalanced portfolios with greater geometric-mean return than any other with same or lesser standard deviation, and lesser standard deviation than any other with same or greater geometric mean return. This mean-variance optimization was done to get an overall picture of NPPF investment portfolio. Initially, major asset classes such as equity, corporate loans, member loans, and fixed deposits were considered to get a holistic picture of investment portfolio.

Markowitz model allows only portfolio weight variables to be manipulated to solve portfolio problem for determining efficient portfolios since the expected returns, standard deviations, and correlation coefficients for securities being considered are inputs in Markowitz analysis. The Markowitz Portfolio Optimization was applied to asset mix of equities, fixed deposits, corporate loans and personal loans (Table-1). The investments and returns were tabulated and computed and analyzed using MS-Excel (Table-1). Upon execution of input, a pie-chart (Figure-4) was constructed with 0.004% variance or 0.6% standard deviation. This result was compared with NPPF’s original investment assigning equal weights to each investment in portfolio (Figure-3). The model suggests (Figure-4) to invest 97% in loans and 3% in equities. Deposits with various financial institutions can be withdrawn and used for other purposes as return is negligible. The return also increased from 7.6% to 8.94% in the optimized portfolio. However, some investment weights have been reduced to zero.

However, Markowitz optimization uses quadratic programming and has its drawbacks. For instance, Markowitz Model remains cumbersome to work with because of large variance-covariance matrix needed for set of stocks (Jones, 2004). Therefore, Markowitz Model was used as a component of a larger LP Model. The flexibility of LP Model allows fund managers to assign variable weights along with constraints according to requirement and get optimum results. For instance, using Markowitz, weights of investments such as fixed deposits and bonds are completely evicted or reduced to 0%, can be overcome using LP model. In addition, the risk factor in Markowitz cannot be adjusted which can be done using LP model.
Table-1: Setting-up variance-covariance matrix to calculate efficient investment weights using Markowitz/Mean-Variance Optimization

<table>
<thead>
<tr>
<th></th>
<th>Equity</th>
<th>Institution Loans</th>
<th>Member Loans</th>
<th>Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weights</strong></td>
<td>7%</td>
<td>49%</td>
<td>45%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td>7%</td>
<td>0.00281%</td>
<td>-0.00029%</td>
<td>0.00022%</td>
</tr>
<tr>
<td><strong>Institution Loans</strong></td>
<td>49%</td>
<td>-</td>
<td>0.00184%</td>
<td>-0.00040%</td>
</tr>
<tr>
<td><strong>Member Loans</strong></td>
<td>45%</td>
<td>0.00022%</td>
<td>-0.00040%</td>
<td>0.00041%</td>
</tr>
<tr>
<td><strong>Deposits</strong></td>
<td>0%</td>
<td>0.00000%</td>
<td>0.00000%</td>
<td>0.00000%</td>
</tr>
<tr>
<td><strong>Total Var</strong></td>
<td>0.00274%</td>
<td>0.00115%</td>
<td>0.00023%</td>
<td>0.00000%</td>
</tr>
<tr>
<td><strong>Geomean</strong></td>
<td>1.00318%</td>
<td>4.20973%</td>
<td>3.72897%</td>
<td>0.00000%</td>
</tr>
</tbody>
</table>

Figure-3: Actual Portfolio Weights

Figure-4: Optimized Portfolio Weights

Stage 2: Portfolio Optimization Using LP model

The second model used to determine optimum portfolio weights and returns is Linear Programming, a widely used model which can solve decision problems with thousands of variables. In investment area, linear programming can be used to select optimal mix of opportunities that will maximize return while meeting the investment conditions of investor (Taha, 2007, p. 30).

LP, a more advanced model, was employed to overcome drawbacks of Markowitz. The asset classes used were similar to Markowitz where w1=equities, w2=bonds, w3=Fixed deposits, w4=corporate loans, w5=personal loans and w6=real estate. Based on historical data, these models were tested (Table-2).

**Step-1: Optimization Based on Average Historical Weights:** The first one is calculated (Table-2) based on average weights of original portfolio wherein total loan constituted 61% of total investment while the least investment was made in real estate with 3% (Figure-5). In addition, the total weighted return is 7% while the portfolio standard deviation is only 0.40%.

**Step-2: Optimizing and comparing average weighted portfolio with current portfolio**

After computing return and risk (standard deviation) with average weights from historical data, status of present weights and returns were determined (Figure-6). The current investment portfolio weights indicated loans (Figure-5) constitute majority accounting for 61% of total assets. In addition, real estate had smallest weight at 2%. The equity investment seems to have increased by about 4% compared to average investment over 6 years.

If Figures-5 and 6 are compared, it can be noted that return of current financial year is higher than average weighted return. The difference in return is 0.73% while in portfolio variance is about 0.001%. Therefore, we tried to optimize the portfolio further (Step-3).

**Step-3: Optimization based on maximum and minimum returns**

For better optimization, maximum and minimum historical weights were used (Figure-7) wherein weights of total loan were increased to 66% and fixed deposits reduced to 13%. This is because optimizer assigned best possible weights for variance and co-variance of returns. For instance, the maximum-minimum constraint assigned for fixed deposits and corporate loan were 12.82% - 32.73% and 29.96% - 45.11% respectively (Appendix-3). Since fixed deposits yielded the lowest returns, it was brought down to 13% and loans were increased. Similarly, both equities and bonds took maximum limit of 9% and 10% respectively wherein calculated maximums were 8.86% and 10.24% for equities and bonds respectively.
Table-2: Table showing computed weights using MS-Excel Solver

<table>
<thead>
<tr>
<th>Average Weighted Portfolio</th>
<th>Equities</th>
<th>Bonds</th>
<th>Fixed Deposits</th>
<th>Corporate Loans</th>
<th>Personal Loans</th>
<th>Real Estate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weights</td>
<td>5.39%</td>
<td>8.94%</td>
<td>21.54%</td>
<td>34.59%</td>
<td>26.37%</td>
<td>2.78%</td>
</tr>
<tr>
<td>Equities</td>
<td>5.39%</td>
<td>0.0006%</td>
<td>0.000006%</td>
<td>0.000004%</td>
<td>0.000037%</td>
<td>0.00007%</td>
</tr>
<tr>
<td>Bonds</td>
<td>8.94%</td>
<td>0.0006%</td>
<td>0.00011%</td>
<td>0.000005%</td>
<td>0.00001%</td>
<td>0.00001%</td>
</tr>
<tr>
<td>Fixed Deposits</td>
<td>21.54%</td>
<td>0.0004%</td>
<td>0.000000%</td>
<td>0.00030%</td>
<td>0.00020%</td>
<td>0.00014%</td>
</tr>
<tr>
<td>Corporate Loans</td>
<td>34.59%</td>
<td>0.00037%</td>
<td>0.00005%</td>
<td>0.00020%</td>
<td>0.000127%</td>
<td>0.00001%</td>
</tr>
<tr>
<td>Personal Loans</td>
<td>26.37%</td>
<td>0.00007%</td>
<td>0.00001%</td>
<td>0.00014%</td>
<td>0.00001%</td>
<td>0.00001%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>2.78%</td>
<td>0.0006%</td>
<td>0.00001%</td>
<td>0.00004%</td>
<td>0.00008%</td>
<td>0.00003%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Variance</td>
<td></td>
<td>0.57%</td>
<td>0.64%</td>
<td>0.89%</td>
<td>2.49%</td>
<td>2.21%</td>
</tr>
<tr>
<td>Portfolio</td>
<td></td>
<td>0.00%</td>
<td></td>
<td></td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td>0.40%</td>
<td></td>
<td></td>
<td>0.00%</td>
<td></td>
</tr>
</tbody>
</table>

Figure-5: Investment Portfolio with average weights based on historical data

Step-4: Deriving suggested portfolio

However, the crux of this study is to suggest an optimized investment portfolio for NPPF. Its annual report for 2011-2012 mentions, ‘revised investment policy aims to invest 30% of its portfolio in equities including equities of state owned enterprises’ (p.23). Hence, weight for equities was set at 30% (Figure-8) where E19 cell addresses of equity. Further, fixed deposits were set to be not less than 5% based on the assumption that fixed deposit parks cash when there is no investment avenue and yields least returns. However, for rest of investment vehicles, maximum and minimum (Appendix-3) was used so that Solver can optimize weights based on maximum and minimum returns of historical data.

Figure-7: Investment portfolio based on maximum and minimum historical weights

Figure-8: Solver constraint window showing constraints assigned for suggested portfolio

Figure-6: Current investment portfolio weights computed from current data
Upon analyzing LP model with assigned constraints, portfolio return increased to 8.31% but portfolio variance also increased to 0.0173% (Figure-7). However, it can be concluded that increase in portfolio variance or standard deviation is minimal compared to average equity standard deviation of 4.56%. Hence, it can be concluded, with minimal increase in risk, the return increases to 8.31%, which is 0.59% higher than current return. To achieve this optimization, weight for total loans (Figure-9) will have to be reduced from 53% to 23% for personal loans and 30% for corporate loans while bonds shall be assigned maximum weight as before. Conversely, fixed deposits and real estate shall be assigned minimum weights owing to minimal yield. Therefore, it can be concluded, if NPPF invests as per suggested portfolio (Figure-9), organization will reap optimum returns.

Therefore, it can be recommended that by maintaining suggested portfolio, NPPF can garner a return of 8.31% compared to its current return of 7.73% wherein investment in equity markets will be increased to ≥30%. Nevertheless, better avenues of equity investments need to be further explored.

![Suggested Optimized Portfolio](image)

**Figure 9:** Suggested Portfolio with Optimum Asset Mix

Although, returns were maximized when investment in equities were earmarked at 30%, standard deviation also increased (Figure-11). Overall, it can be observed that equities have highest variance or standard deviation and bonds have the lowest (Figure-10). This is justified due to nature of equity and fixed income security markets.

However, due to non-existence of a stock index, more efficient-less cumbersome optimization like *Capital Asset Pricing and Sharpe’s Single Index Models* have not been used as also unavailability of cash inflows from member contribution and maximum/minimum investment amounts, historical data based models. These historical data were only of 6 years.

### 6. RECOMMENDATIONS

The investment portfolio can be optimized by adopting suggested weights (Figure-7), i.e., increasing investment in equity markets and lowest possible investments in fixed deposits. Investment avenues, outside Bhutan, with the purpose of achieving higher returns may also be explored to avoid excess money sit idle. To increase equity investments ≥30%, NPPF needs to be watchful about upcoming projects in Bhutan and invest prudently. Suggested investment optimization is static data (annual data) based which can be made more dynamic and vibrant by referring daily or monthly data for future researches.

![Four different weights computed with LP model](image)

**Figure 10:** Summary chart showing S.D. changes with four different weights by Solver

![The Return and Risk of four different weights](image)

**Figure 11:** Return-risk of four different weights

### 6. CONCLUSION

The analysis can be summarized (Figure-10) where yellow bar represents suggested/optimum portfolio for NPPF. The figure also shows that in all four scenarios, real estate is assigned least weight followed by bonds. However, fixed deposits were assigned 5% weight, and suggested portfolio also kept weight of bonds at 5% (minimum). Owing to low yields bond were assigned minimum proportion of investments.
Inflation is not factored in this study. However, return of suggested portfolio is much higher as compared to current portfolio, and inflation being common variable, return of optimized portfolio will always be better.

i) Adapted from the book Investment Management authored by V.A. Avadhani
ii) Markowitz or Mean-Variance model
iii) Linear Programming Model

REFERENCES

BUSINESS PRACTICES OF MICRO ENTERPRISES

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ABSTRACT

The role of micro enterprises in the development of economy is emerging as a key factor and its importance in the recent years is gaining momentum as it targets people at the bottom of the society, especially women, promotes self employment and reduces unemployment problem. Various studies across the globe reveal that involvement of women in small and medium enterprises found to be more than 40 percent and in India it is still 7 per cent. This paper is an attempt to categorize the common business practices of micro enterprises run by women with a special focus to identify the common finance and accounting practices of such enterprises. Case study approach has been adopted in this study as it deals with “How” and “Why” questions which delve into the past, analyze the present and focus on the future. Using these two types of questions, the selected micro enterprises are qualitatively analysed and interpreted. From the analysis it is found that micro enterprises run by women are not only financially sound but also successful and some were posing a severe competition to other branded products in their respective locality. It is observed from the study that the practices adopted by them which had given them hope are sources of investment, savings practices, maintenance of accounts, repayment of loan, expenditure patterns, working capital, budgets, and use of vouchers. It is highlighted from the study that micro enterprises run by women are doing well and they should be given importance for toning up the economy of the country.


1. INTRODUCTION

Micro enterprise is being recognized as an effective poverty alleviation tool. It promotes entrepreneurship at the grass root level and creates self-employment opportunities. It is a small business, which involves low capital, low risk but fairer return. Micro enterprise is, by and large, a family based activity. It is usually unregistered. Micro enterprises are distributed over urban, semi urban and rural areas. However, the understanding of micro enterprise differs from country to country. For example, in USA, the micro enterprises are those with five employees or less, while a small business is categorized as one with more than five and up to 500 employees. The US Agency for International Development has defined a micro enterprise as a business with ten or fewer employees with low assets and one owner who is poor¹. Several studies have identified the various types of economic activities that are undertaken by the micro entrepreneurs and the problems they face are also varied. The impact of micro enterprises on the individuals, community and nation is also significant.

The Government of India enacted an Act “Micro Small and Medium Enterprises Development (MSMED) Act, 2006. As per this Act, the official definition of the Micro Enterprises is classified into two: (a) Manufacturing Enterprises which are engaged in the manufacture or production of goods and are defined in terms of investment in Plant and Machinery and (b) Service Enterprises which are engaged in providing or rendering services and are defined in terms of investment in Equipment. In Micro enterprise in manufacturing sector, the Investment in Plant and Machinery does not exceed Rs 25 lakhs. In Micro enterprise in Service Sector, the Investment in Equipment does not exceed Rs 10 lakhs. The above mentioned definition under the Act is considered as the operational definition of micro enterprise in the present study.

2. NEED AND IMPORTANCE OF THE STUDY

Micro, Small and Medium Enterprises (MSMEs) are the backbone of any sector in a country. MSMEs contribute up to 75 per cent of Gross Domestic Product (GDP) and provide 75 to 80 per cent of employment opportunities².


Micro enterprises require support as they fulfill many priorities of development economics, such as, the development of the private sector, the empowerment of women through income generation, the implementation of community development by private initiatives, and the contribution to a fairer income distribution. Micro enterprises are the engines of economic growth. According to the Organization for Economic Cooperation and Development (OECD) (1993), Micro enterprise is making a silent revolution in the Indian economy. It aims at empowering, enhancing and sustaining the individuals and leading to a higher standard of living. Therefore micro enterprise has promoted entrepreneurship at the grass root level to a great extent.

3. RESEARCH QUESTIONS

In this context and background, the two major researchable questions that emerge are Researchable question 1: What are the business practices that are widely adopted or not adopted by the micro enterprises?

Researchable question 2: In performing the activities of micro enterprises, to what extent the micro entrepreneurs are ‘business like’ in their approach?

4. STATEMENT OF THE PROBLEM

It is known that micro enterprise contributes significantly to economic growth, social stability and reduction of poverty. Micro enterprise provides food security, fulfills the basic needs of the rural population, promotes children’s education, and empowers women, family and society. Various studies have revealed the different types of economic activities of micro enterprises such as tailoring, fish vending, book binding, vegetable vending, tea stall, poultry breeding, pottery, candle making, readymade garments, phenyl, nutrition mixes, petty shop, milch animal, power looms and computer operation. Micro enterprises encounter internal and external problems. For example, in Kanpur, which is known as the Manchester of India, the infrastructure is poor. A a result, many enterprises either have closed down or shifted from poor to better locations. Tirupur which is considered as the Manchester of South India faces two major problems in the textile industry, namely power cut and poor transport. Lack of credit, power shortage and increasing competition from other silk manufacturing centers have placed Bhagalpur craftsmen under jeopardy. The various internal problems which micro enterprises encounter are lack of technical skills, managerial skills, marketing knowhow, problems of working capital, socio-cultural barriers and low-level risk taking attitude.

Several studies have also brought out the level of empowerment of women due to taking up of micro enterprise. The women have been empowered socially, culturally, economically and psychologically. The impact on the economic aspect has been very predominant in most of the studies. Attention has also been paid on the contribution of micro enterprise on the economy of the country. Its role in enhancing the economy of the country is laudable. However, in spite of the several studies on the many problems faced by the micro enterprises, types of activities undertaken by the micro entrepreneurs, level of impact on the growth and development of the weaker sections of the society and its contribution for the national economy, many literatures show, that there is one important area that needs special consideration namely the business practices followed by them. Business practices are those activities which are normally carried on by the micro entrepreneurs for performing the economic activity. The focus on the business practices is observed to be very vital for inculcating professional approach. Hence, the present study concentrates on the business practices of micro enterprises.

5. OBJECTIVE OF THE STUDY

The overall objective of the study is to categorize and describe the common finance and accounting business practices of the selected micro enterprises.

6. METHODOLOGY

The present study analyses the business practices of micro enterprises through case study method. Case study is a deep, detailed and intensive study of a social unit, a person or situation. It is a comprehensive study of a social unit. It attempts to study and understand the interplay of various complex factors. It tells that success is not because of what one knows but because what one does. Case study is basically qualitative and descriptive based on the primary data. Case study is considered an appropriate method as it brings out the reality of a situation. In case study method, a research design is a logical plan or model of proof that allows the researcher to draw inference concerning casual relations among the variables under investigations.

There are four types of case study research designs⁴: Type 1 design is Single case (Holistic), Type 2 design is Single case (Embedded), Type 3 design is Multiple cases (Holistic) and Type 4 design is Multiple cases (Embedded). Single case (Embedded) design is used in this study as it aims to study the broad aspect of the topic under study.

7. SAMPLE AND DATA COLLECTION

The study is undertaken in Tiruchirappalli District, Tamil Nadu, South India. Micro enterprise run by the members of Self Help Groups (SHGs) formed and supported by Grama Vidiyal Micro Finance Limited (GV MFL) in Tiruchirappalli district is taken for the study. The Activists for Social Alternatives – Grama Vidiyal Micro Finance Limited (ASA-GV MFL) is the one of the largest Micro Finance Institutions (MFIs) in India especially Tamil Nadu. It is ranked one among the top ten MFIs in the country. ASA-GV MFL serves in four states in India, forty nine districts through 327 branches. It has a total of 10,46,497 clients. For the present study data has been collected from 37 first time micro enterprises which are in operation for more than three years, run by married women in Tiruchirappalli and Srirangam division of GV MFL.

The process of data collection includes direct observation and interview. The responses were recorded manually and with electronic device. The researcher classified the selected micro enterprises into five categories. They were Agro Enterprises (Areca nut, Flower, Bamboo stick and Tobacco), Production and Manufacturing Enterprises (Police cap, Shoes, Pots, Chalk pieces, Gem cutting, Soda, Bricks, Sambirani, Coir, Soap powder, Plastic covers for containers, and Photo frame) Service Enterprises (Tailoring, Dry cleaning, Flour Mill, Rice mill) Trade Enterprises (Furniture, Fancy store (Assorted plastic items), Readymade garments, Cell phones, Birds, Agarpathi, Provisions, Broiler chicken, and Dry fish) and Food and Beverages Enterprises (Tiffin, Pickles, Bakery products (Confectionaries), Samosa (Snacks), Appalam (Snacks), Badham milk (Flavor milk), Ice cream and Murukku (Snacks)).

<table>
<thead>
<tr>
<th>Agro Enterprises (4)</th>
<th>Production and Manufacturing Enterprises (12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areca nut, Flower, Bamboo</td>
<td>Police cap, Shoes, Pots, Chalk pieces, Gem cutting, Soda, Bricks, Sambirani, Coir, Soap powder, Plastic</td>
</tr>
<tr>
<td>stick and Tobacco</td>
<td>covers for containers, and Photo frame</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Enterprises (4)</th>
<th>Trade Enterprises (9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailoring, Dry cleaning,</td>
<td>Furniture, Fancy store (Assorted plastic items), Readymade garments, Cell phones, Birds, Agarpathi, Provisions,</td>
</tr>
<tr>
<td>Flour Mill, Rice mill</td>
<td>Broiler chicken, and Dry fish</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food and Beverage Enterprises (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiffin, Pickles, Bakery products (Confectionaries), Samosa (Snacks), Appalam (Snacks), Badham milk (Flavor milk), Ice cream and Murukku (Snacks).</td>
</tr>
</tbody>
</table>

It was face to face interaction with the micro entrepreneurs which helped the researcher for obtaining primary data. All the discussions and interactions with the respondents were done in vernacular language (Tamil).

8. RESULTS AND INTERPRETATIONS

From the analysis of the data obtained through personal contacts with the respondents, the following finance and accounting practices are found to be common among the selected micro enterprises.

8.1. Total Investment and Its Sources

Investment is an important aspect of business as it determines the size and level of operations of any business concern. The following are the investments made by micro enterprises considered in the study.

To the question on the level of investment in the business, it is found from the study that forty nine per cent of the micro entrepreneurs invested less than Rs 100,000 in their business, twenty seven per cent of the micro entrepreneurs invested between Rs 100,000 and Rs 200,000, three per cent of the micro entrepreneurs invested between Rs 200,000 and Rs 300,000 and twenty one per cent of the micro entrepreneurs invested more than Rs 300,000. It is therefore observed that less than half of the respondents have investment of less than Rs 100,000. As they are micro in nature and also entrepreneurs are from marginalised population, enterprises are seen with very low investments as against big industrials houses.

It was intriguing question to know how these micro enterprises are getting their finances for making investments in their business operations as big business houses have numerous sources for getting finance. Different source available are: own funds, borrowed funds from Micro Finance Institutions, NGOs, Banks, Friends, Money lenders, SHG, Government sources, and Family members From the collected data, it was seen that own funds and borrowed funds were the two main sources for the micro enterprises included in the study. Own funds formed as major source for most of the enterprises (62%). The borrowed funds were from Grama Vidiyal Micro Finance Limited (GV MFL). According to the respondents, the loan from GV MFL for the business activity ranged between Rs 25,000 and Rs 50,000.

<table>
<thead>
<tr>
<th>Sources of Funds</th>
<th>RESPONDENTS</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own Funds</td>
<td>23</td>
<td>62.2</td>
</tr>
<tr>
<td>Borrowed Funds (From GV-MFL)</td>
<td>14</td>
<td>37.8</td>
</tr>
<tr>
<td>Loan amount from GV-MFL</td>
<td>Ranges between Rs 25,000 and 50,000</td>
<td></td>
</tr>
<tr>
<td>Rate of interest</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Period of repayment</td>
<td>Two years</td>
<td></td>
</tr>
<tr>
<td>Type of repayment</td>
<td>weekly</td>
<td></td>
</tr>
</tbody>
</table>

While explaining the procedures followed by GV MFL to sanction the business loan, the micro entrepreneurs said that the purpose of the loan was for business activities. Rate of interest was twelve per cent and the period of repayment was two years. The repayment of loan was on weekly basis. Almost all the micro entrepreneurs expressed that they were satisfied with this type of weekly repayment system as it did not tax them much and it was easy for them to repay. However, the need for higher amount of loan was expressed by all the micro entrepreneurs for better performance of the units. Therefore, it may be inferred that own funds was the major source for a vast majority of the micro entrepreneurs. Less than half of the micro entrepreneurs had invested less than Rs 100,000. Weekly repayment of loan was appreciated by them. However, all the entrepreneurs expressed the need for scaling up of loans from the financial institutions for better performance of the units.

8.2 Support for Decision Making

Decision making is very vital for both personal as well as public life. It implies a focused mindset for achieving the target. Innovation, initiative and motivation, leadership, managerial skill, marketing skill, decision making skill, risk orientation, uncertainty bearing ability, financial management, and ability to manage the changing situation were some of the entrepreneurial competencies required for successful performance of the economic activity. If an entrepreneur herself takes the decision it may exhibit her individuality and her empowerment and it she has to be depending on someone else will indicate as if still there needs to be support for empowerment. Therefore, decision making skill is considered as an important skill and vital for entrepreneur. In view of knowing the how the decisions are taken by the owners of these micro enterprises, the researcher asked the micro entrepreneurs about the method followed by them in making decisions. It was observed that there were two common methods of taking decisions related to the financial aspects of the business undertaken by the micro entrepreneurs.

It was found that ninety five per cent of the micro entrepreneurs took all decisions related to the business in consultation with their spouse. In some cases depending on the nature of the activity decision are taken after consulting experts, friends, employees and children. Women entrepreneurs did not take business decision on their own rather all their decisions are in consultation with their spouses. The reasons cited and expressed for their dependency were their literacy level, male domination, lack of ability to decide alone, lack of other managerial skill, avoiding loss in the business, lack of business related skills, lack of deep knowledge about the business, techniques involved in the business and dealing with external sources of finance.

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5 Asokan T and Hemalatha, op.cit., 2010., Clifford., et al., op.cit.2011
At the same time, it was also observed that the micro entrepreneurs took independent decisions regarding all household matters like purchase of new assets for their houses, jewels, groceries and education of children.

### 8.3. Maintenance of Accounts

Maintenance of accounts is considered another important business practice related to any type of business activity. It reflects the way the business is run by the entrepreneurs and their seriousness, transparency, accountability and also the professional way of running the business. It also helps business enterprises to assess their performance and achievements over the period of time and based on such information future decision are made very simple.

<table>
<thead>
<tr>
<th>Maintenance of accounts</th>
<th>RESPONDENTS</th>
<th>PER CENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual</td>
<td>18</td>
<td>48.6</td>
</tr>
<tr>
<td>Memory</td>
<td>19</td>
<td>51.4</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>100</td>
</tr>
</tbody>
</table>

It was obvious that a majority of the micro entrepreneurs relied on their memory for maintaining the accounts. The reasons put forward by the micro entrepreneurs for relying on their memory were that their units did not require writing of the accounts or maintenance of records due to the routine nature, simple and familiar types of activities. And also the honesty of the customers in repaying the debts did not demand any formal way of maintaining accounts. Hence the micro entrepreneurs considered that their memory was sufficient for running the business effectively. Writing of income and expenses is the basic method followed by an entrepreneur whether s/he runs a micro, small, medium or large business unit. Usually medium and large firms have separate departments for the purpose of maintaining accounts. It was found that fifty one per cent of the respondents did not have the habit of writing the accounts. Among the micro entrepreneurs who had the habit of writing the accounts, it was learnt that seventy eight per cent of the micro entrepreneurs, the accounts were written by employees, children, accountants and twenty two per cent of the accounts were written by the micro entrepreneurs themselves.

Hence dependency on the employees and children for the maintenance of the accounts was common and high among the selected micro entrepreneurs. The reasons for depending on the employees and the children were low literacy level of the micro entrepreneurs and lack of time as the micro entrepreneurs were involved in multifarious functions such as purchases, production, and marketing.

Hence, they could not allot time for writing the accounts or record keeping. Some researchers had shown that entrepreneurs who had low level of education could also cope with the challenges of running their businesses without much difficulty and without the basic knowledge in accounting⁶. During the interview, it was observed that though the micro entrepreneurs were not much educated, they showed a lot of interest and desire for writing the accounts regularly and hence they sought the help of their children or employees for writing the accounts. When asked about the frequency of writing the accounts, eleven per cent of the micro entrepreneurs said that they wrote the accounts on a daily basis, seventy eight per cent of the micro entrepreneurs wrote the accounts on a weekly basis, and eleven per cent of the micro entrepreneurs wrote on a monthly basis. It was noticeable that a large majority of the micro entrepreneurs had the habit of writing the accounts on weekly basis. A simple note book was maintained which contained the basic details of the repayment of loan to GV MFL and also some details regarding the business. When the researcher verified the note books, it was found that even those who wrote the accounts were not regular, proper and systematic.

Therefore, the levels of education, nature of the business activity, size of the business, memory, weekly basis writing of accounts and characteristic of the customers were the factors related to the maintenance of accounts.

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8.4. Savings Practices

It was also observed that the micro entrepreneurs with higher level of education had better understanding and awareness about writing of accounts.

Savings is an important business activity which ensures the continuity of the business. Saving practices followed by the micro entrepreneurs are varied. Some save with banks, in insurance schemes, and in Self Help Groups (SHGs).

After undertaking the economic activity, all the entrepreneurs had started having accounts with banks. The amount of savings had increased from the time of starting the SHGs\(^7\). Weekly basis savings influenced sustainability\(^8\). It was observed that the selected micro entrepreneurs followed two types of savings namely in insurance schemes and with banks. Sixty five per cent of the micro entrepreneurs saved in insurance schemes and thirty five per cent saved with banks. The reasons for the preference given to save in insurance schemes were found to be convenience, easy and flexibility. According to the micro entrepreneurs, saving in insurance schemes was considered safer than savings with banks. Therefore saving in insurance schemes was common among the micro entrepreneurs. With regard to the amount saved by the micro entrepreneurs, it was learnt that twenty two per cent of the micro entrepreneurs saved less than Rs 500 per month, sixty three per cent of the micro entrepreneurs saved between Rs 500 and Rs 1000 per month and sixteen per cent of the micro entrepreneurs saved more than Rs 1000 per month. Hence, it was seen that a majority of the micro entrepreneurs were able to save between Rs 500 and Rs 1000 per month. The micro entrepreneurs stated that amount spent for the education of their children, purchase of new assets like TV, vehicles, jewels, and loan settlements without default were also different forms of savings and investments. Therefore savings in insurance schemes, regular monthly savings, and purchase of new assets both for the business as well as for houses were viewed as some common saving practices by the micro entrepreneurs.

8.5. Accumulation of Assets

Kibas (2001)\(^9\) observed that the micro enterprises could provide profits to purchase fixed assets such as commercial plots, business premises and tools and equipments for production. After undertaking the economic activity, tin roofs had replaced thatches, waterproof structures, creation of permanent assets, houses with better ventilation, some domestic assets like radio, mobile phones, TV, two wheelers, cots and other small household assets were some of the other assets the micro entrepreneurs acquired. Outer equipments and machineries had also been purchased with the profit from the business\(^10\). Accumulation of assets is another important factor relating to the finance and accounting practices of micro enterprises. Capacity of a business to generate profits and accumulation of assets are interrelated and imply the sustainability of a business unit.

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7Muthu Pandian, op.cit., p.327.
8Shaji, P.K., op.cit. 2010.
10Sridhar Krishna., op.cit., p.19
<table>
<thead>
<tr>
<th>Tangible Assets</th>
<th>Intangible Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machines,</td>
<td>Enhancement of self confidence</td>
</tr>
<tr>
<td>Two wheeler</td>
<td>Improvement in self image</td>
</tr>
<tr>
<td>Jewels Cots</td>
<td>Self perception</td>
</tr>
<tr>
<td>Auto Grinders</td>
<td>Improvement of managerial skills</td>
</tr>
<tr>
<td>Own house</td>
<td>Decision making ability</td>
</tr>
<tr>
<td>House on lease</td>
<td>Knowledge about the society and the business.</td>
</tr>
<tr>
<td></td>
<td>Good will</td>
</tr>
</tbody>
</table>

It was seen that the micro entrepreneurs had created two types of assets out of the profit from the business: Tangible and Intangible assets. Tangible assets related to the business and household like machines, two wheeler, jewels, cots, auto, grinders, own house, and house on lease. All the micro entrepreneurs admitted that they had acquired adequate tangible household assets from the profits. Intangible assets were in respect of the empowerment of the micro entrepreneurs and the members of the family in terms of enhancement of self confidence, improvement in self image, self perception, improvement of managerial skills, good will, decision making ability, knowledge about the society and the business they were involved in.

In the opinion of almost all the micro entrepreneurs, investment for the education of the children and loan repayment on time was considered important asset building exercise. From the interview, observation and discussion with the micro entrepreneurs, it was seen that almost all the micro entrepreneurs had used the profit of the business for different purposes like expansion of the business, purchasing of assets and clearing of debts. It was therefore obvious that all the micro entrepreneurs had increased their asset capacity after taking up the entrepreneurial activity. It had become the source of livelihood and strong support for their well-being. It added value to persons as well as the business and enhanced the image of both.

8.6. Managing Debts

Various literatures showed that no micro enterprise could operate completely free of debt. Managing debts is one of the key finance and accounting practices of any type of business activity. In the in-depth interview with the researcher, the micro entrepreneurs said that they had no difficulty in managing their debts. It was seen that the micro entrepreneurs had adopted different methods of managing their debts. The micro entrepreneurs were asked to give details about the reasons for choosing the particular type of economic activity they were involved in. Among the various reasons like heredity, experience, low investment and level of literacy for choosing the type of economic activity, it was found that according to the micro entrepreneurs, the type of economic activity undertaken by the micro entrepreneurs generated sales revenue. The revenue generated by the enterprises was sufficient to manage the debts. The micro entrepreneurs were also careful in the purchase of materials and goods required for the business and they avoided wastages. Another important useful, convenient, and easy method to manage the debts according to the micro entrepreneurs was the weekly collection of interest by GV MFL. It facilitated managing the debts without much difficulty.

Good relationship built over the years by the micro entrepreneurs with the customers was cited as another important reason which helped the micro entrepreneurs to manage the debts. They relied on the customers for some short term loans without interest. Similarly, informal networks with some wholesalers, departmental stores, schools and other entrepreneurs were also of great help for managing the debts. The micro entrepreneurs at times could delay the payments as they had good rapport with the customers. The micro entrepreneurs preferred only cash purchase which helped for running the day-to-day business without any difficulty. However, for emergency credit purchases was considered another form of managing debts.

Hence, types of business activity, profit accrued out of the business, weekly collection by GV MFL, good relationship, informal networks with some financial units, long term relationship and association with the customers, careful investment, avoiding wastages, cash rotation among the friends, cash purchase, adopting credit purchase for emergency were the different informal but convenient and conventional methods adopted by the micro entrepreneurs for managing their debts. Above all, according to the micro entrepreneurs, their businesses had the capacity and potency to generate sufficient revenue and so there was no difficulty to repay the loan and manage the debts.

8.7. Working Capital

Working capital is an important aspect of finance and accounting practices. Working capital is one of the influential factors of performance\(^1\). Working capital is necessary for funding the purchase of raw material, ensuring supply of quality products to customers, payment of wages, and meeting immediate manufacturing,
administration and operational expenses. It is the money needed for running the day-to-day activities of business firm. It is considered the life blood of any business concern. Working capital provides adequate support for smooth and efficient functioning of normal day-to-day business. This practice helps for being competitive in the competitive business environment. Working capital had a bearing on profitability.\footnote{12}

Fixed assets are capital investment and current assets are termed as working capital and they are meant to produce, and means to operate the fixed assets and generate profits. The management of current assets relates to the management of funds available which help for meeting the operational requirements. Current assets could also be called the circulating capital. Working capital management relates to the profitability of the enterprise and aims at stability and growth of the enterprise. Working capital management includes aspects like cash management, inventories and receivables. The amount of working capital needed by the fisherwomen depended on the quantity of fish sold.\footnote{13} Working capital was the problem for the micro entrepreneurs.\footnote{14}

To an enquiry on the nature, structure and management of working capital management, it was noted to be cash and bank balance, inventories and deposits. However, working capital management among the micro enterprises was basically and primarily cash management. It provided operating ability to an enterprise to fully utilize the assets created by long term investment. In the selected micro enterprise, it was observed that the impact of the working capital was an important aspect. It had internal surplus generation and equity contribution. Therefore, for the selected micro enterprises, working capital is primarily cash balance. It was also observed that the micro entrepreneurs were dependent on banks, and friends for borrowings for the need of working capital. It was seen that inadequate and absence of timely financial support restricted or reduced their operating level. Hence, availability of adequate and timely finance was considered necessary. They had direct impact on the working capital management in micro enterprises. Hence, provision for working capital was felt to be a need by all the micro entrepreneurs.

8.8. Expenditure Pattern

A study on the pattern of expenditure is necessary for taking the business to next level. Diversification of business was not the aim instead increase in the volume of products had been the mode of expansion.\footnote{15} Expansion of operation implies sustainability aspect of the business concern.\footnote{16}

<table>
<thead>
<tr>
<th>RESPONDENTS</th>
<th>PER CENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major monthly expenditure</td>
<td></td>
</tr>
<tr>
<td>Business expansion</td>
<td>37</td>
</tr>
<tr>
<td>Major monthly routine expenditure</td>
<td></td>
</tr>
<tr>
<td>Salary for employees</td>
<td>18</td>
</tr>
<tr>
<td>Payment of rent</td>
<td>5</td>
</tr>
<tr>
<td>Office maintenance etc</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
</tr>
</tbody>
</table>

To an inquiry on the expenditure pattern of micro enterprises, all the micro entrepreneurs said that expansion of the business was a major and common expenditure. From the interview with the micro entrepreneurs, it was learnt that expansion of the business did not mean starting of new enterprises or opening of new branches. It was diversification of products and operation in view of meeting the needs of the customers and sustaining their economic activity. It was also observed that for forty nine per cent of the micro entrepreneurs routine expense was payment of salary to the employees, for fourteen per cent payment of rent, for thirty eight per cent office maintenance and other expenses like payment of bonus and allowances. Meeting the educational expenses of their children, provision for monthly savings, and repayment of loans were also other financial charges incurred by the micro entrepreneurs on regular basis. According to them, all these were not expenditures but investment for the future. All of them said that their present businesses were viable and had the potency to generate regular and stable income and profit to meet all these expenditures.

\footnote{11}Elango., K.op.cit., 303-323
\footnote{12}Banerjee., op.cit.225-234.
\footnote{13}Gunakar, S., et al., op.cit. p.299.
\footnote{15}Avodaianmal and T Rajasekar.,op.cit.p.178.
\footnote{16}Jashwins Jothishna Narayan., op.cit.p.44.
8.9. Budget Making

Budget is an important tool for assessing the cash inflow and outflow of any business enterprise. It serves both as a planning and control device. It is helpful for periodic assessment of the status of the financial situation of a firm whether small, medium or large.

<table>
<thead>
<tr>
<th>Preparation of Budget</th>
<th>RESPONDENTS</th>
<th>PER CENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>73</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>100</td>
</tr>
</tbody>
</table>

From the interview and analysis, it was found that seventy three per cent of the microentrepreneurs did not prepare their budgets. The various reasons cited by the micro entrepreneurs and observed by the researcher during the interaction for not preparing the budgets were: long years of experience, nature of business, size of business, low turnover, not feeling the need and level of literacy. Among these, the long years of experience of the micro entrepreneurs, size and nature of the business emerged as the most important reason. Though a majority of the micro entrepreneurs did not prepare a formal budget for their units, it was observed that some of the micro entrepreneurs had informal cash plans or estimates prepared by them. And also a small note book which was maintained by a majority of the micro entrepreneurs contained some details relating to the purchases, sales, and repayment of loans.

It was found that even those who prepared the budgets did not do it using any scientific method but it was based on their experience in the business and their memory. It was observed that all the micro entrepreneurs, irrespective of the different sectors they were involved in and their literacy levels, expressed their positive opinion about the need for training and scientific way of preparing the budget for ensuring better performance and sustainability of their units. Another important factor related to the budget was the level of literacy. It was obvious that the level of literacy had its influence on the need, importance and preparation of budget. It was noted that the micro entrepreneurs with higher education understood the need for budgeting and they prepared the same for their units. It was found and inferred that though the micro entrepreneurs had no formal budgets they had the informal cash plans or estimates which facilitated them in performing their business activity. It was also observed that long years of experience with the enterprise, the level of literacy, nature of the business, the type of the activity chosen, low turnover, the size of the business and volume of transaction were some of the reasons for not preparing budgets.

8.10. Use of Vouchers and Bills

Use of vouchers and bills is another business practice that is common among the selected micro enterprises. Use of voucher is normally an obligation for an enterprise especially for the registered unit.

<table>
<thead>
<tr>
<th>Use of vouchers and bills</th>
<th>RESPONDENTS</th>
<th>PER CENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>8</td>
<td>21.6</td>
</tr>
<tr>
<td>No</td>
<td>29</td>
<td>78.4</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>100</td>
</tr>
</tbody>
</table>

As regards use of bills and vouchers it was observed that seventy eight per cent of the micro entrepreneurs did not use bills or vouchers. The reasons cite by them for not using bills and vouchers are: nature of business like home based and cottage industry and the other reason is size of business. Though it is true that a large majority of the micro entrepreneurs do not use bills and vouchers, almost all the micro entrepreneurs expressed that the use of bills and vouchers would have its advantages like getting different kinds of assistance from the Government. As use of vouchers promotes accountability, transparency and credibility, the Government is expected to come out with some proactive legal measures for the benefit of micro entrepreneurs.

9. DISCUSSION

This study has accounted the common finance and accounting practices of the selected micro enterprises run by women. It is observed that the micro enterprises were run with own funds of Rs.100000 and with some borrowed funds. Without formal budgets the enterprises were observed to operate effectively and efficiently. They
were running the enterprises with the support of spouse and children. Employees were of great help for taking decision. However the women were taking decisions independently in terms of house hold activities. For writing and maintaining accounts, some of them were dependent on the employees. The literacy level of the selected entrepreneurs was not high and they seemed to lack managerial and business related skill. At the same time, almost all of them were prompt in repaying loans every week. Mental memory and honesty were the biggest assets on which they were depending upon for maintenance of accounts. They could satisfy the needs of customers through their relationships and direct contact. Income generated from business was used for purchase of important assets, repayment of loan, education of children and expansion of the products and operations. Maintenance of good and smooth relationship with the customers was observed to be one of the important instruments for sustaining their entrepreneurial activity.

The following chart depicts the common finance and accounting practices of the selected micro enterprises.

10. CONCLUSION
A healthy economy of an individual, national and global is possible only when the micro enterprises at the grass root level are given sufficient recognition and importance. Micro enterprises at the grass root level, make a strong foothold at the local level. Their contributions in creating employment opportunities, poverty alleviation and reducing unemployment problem have been significant in recent decades. Though their role is remarkable and commendable, their journey is not devoid of challenges. Micro enterprises are by and large family based activities, small, unregistered and informal in nature; their sustainability is seen as a major concern. However, the personal approach, hereditary business, good and healthy rapport with the customers, informal relationships and informal selling agreements maintained by the respondents seem to be the rules of the game. All these certainly require support and formalized approach for ensuring better performance and sustainability of the micro enterprises. The present study finds that the women micro entrepreneurs at the bottom of the society are not employees but entrepreneurs, not job seekers but job providers and they are no more burdens and victims of the society but are resilient and beacons of hope.

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REPORTS

INDIAN BANKING & MANAGERIAL UNIONISM: (AN EMPIRICAL STUDY OF KEY FACTORS AFFECTING WHITE COLLAR EMPLOYEES IN BANKING)

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Maharaja Group of Colleges, Udaipur
Rajasthan Technical University, (Raj.)
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ABSTRACT
The emergence and growth of unionism among managerial categories of industrial employment is being watched with considerable interest among people concerned with industrial relations and industrial performance. At one end of the spectrum, there are citizens, administrators and practical managers who associate trade unionism with militancy, disharmony, loss of production and such other socially undesirable consequences. These people would the spread of managerial unionism an indication of the spread of socially and economically harmful forces in industry. At the other end, there are ideologically committed people who would look upon the inclusion of new categories of employees within the white collar union fold as a sign of growing class consciousness and solidarity among officers in the country.

This study talks about analyzing managerial unionism in relation to Indian banking industry and tries to answer some of basic questions with empirical data regarding demographic factors. How age, designation, education, experience and also their background contribute for the emergence and growth of white collar unionism in Indian context. These issues have been partially answered with the help of empirical data available across organizations of various types.

The membership percentage aspect also been taken into consideration to know the growth of unionism among white collar employees in banking industry. It is evident from the findings that if there is very high percentage of membership, so we can predict the inclusion of this class into mainstream by recognizing and providing them a platform to represent themselves as a “Third Force” in collective bargaining process. Keywords: Unionism, Consciousnesses, Industrial Relation, White Collar, Collective Bargaining

1. INTRODUCTION

Indian Corporate World is today facing many challenges posed by global as well as domestic competition. Perhaps the most difficult of these challenges is the one posed by the manpower of an organization. The size of manpower has been growing over the years. The employees are better organized today than ever before and the influence of trade unions has grown manifold. Today’s worker, compared to his counterpart of yesteryears, is more educated and better informed. His hopes and aspiration are quite high and he is not shy of using collective action to release the same.

Trade unionism in India is not confined to blue collar industrial workers alone. It has spread over white collar salaried employees as well. White collar employees who were shy of trade unionism in the beginning were unionized in a big way in the past four decades. White collar employees both in the government sector and in public and semi public sector have form strong managerial unions. The old distinction between blue collar and white collar workers has almost disappeared as all of them now belong to the same unions. Highly skilled worker’s and qualified technicians, who used to be vary of trade unions but are also taking active part in union activities. In many cases, the supervisors to have either join the existing workers union or formed a separate union or an association. The latest entrants to the trade union movement are the higher level employees like civil servants, technical professionals, doctors, pilots, managers of PSU’s like bankers, insurance and corporation related to public enterprises. Some of them have professional associations of long standing. However, officers started organizing into trade unions about four decades ago. Officers in industries, banking, insurance and other public and semi public enterprises have established OA’s. Officers generally do not use the term trade union but they call their union as an “Association”. All associations in a single undertaking or industry usually combine into federations at the all India level; and federations have combined into confederations of federations of officers in India.

2. REVIEW OF LITERATURE

There is not many studies of unionism among white collar unions. A few empirical studies by Goil (1968), Mitra (1968), Pandey (1968), Punekar (1971), are concerned mainly with the nature and extent of white collar unionism and the facilitating and restricting such unionism.
Dayal and Sharma (1971) studied the first 17 day strike by officers in SBI. They found that unlike clerical employee unions, officer’s association was not officially recognized by the management. Sharma (1974) quotes that few labor organizations were formed by “the relatively more educated workers in railway, textile and printing industries”. Das (1975) has observed one reason, why the officer’s associations emerge with large number of people with common problem of work condition and experiences at a given point of time. Nandy (1980) holds that lack of participation as one of the factor responsible for collectivization of junior and middle level managers in India.

Kanhare (1987) found that the reason for OA formation was a little difference between the income of bank officers and that of the unionized staff. Mamkootam (1989) has listed a variety of methods adopted by OA’s making collective bargaining more effective. Mukherjee (1989) has reported that methods adopted by OA’s in India not merely confined to making collective representations but also include “Dharnas and Gheraos” Sen (1990) confirmed that there is a shift in changing trends for the managerial class to negotiable for their demands. Bhasin (1991) reports that reasons for OA’s formation in HMT, HAL and ITI were the demonstration effect of unionization of officers in banking sector. Seth (1996) discussed various activities and methods adopted by unions in India. Venkatratnam (2003) pointed out that collective bargaining brings a change and restructuring is must in a liberalized world economy. Ramaswamy and Agrawal (2012) found that growth, skill, and quality and length of employment are related to each other in the long run.

This Research paper explores ------------

A. Analysis of demographic factors of officers/ managers for managerial unionism in banking industry.

B. Analysis of membership for OA’s in banking Industry.

3. RESEARCH METHODOLOGY

This paper is based on primary data of demographic factors of officers / managers in banking industry. The data collection has been done through questionnaire method. The total sample size was 200 officers / managers in different banks. Graphical method has been used to show the % of different demographic factors in comparing various categories.

4. RESULT ANALYSIS

There were six demographic factors as Age, Promote/Direct Recruits, Total Work Experience, Educational Level, Family Class and Designation/Position taken into consideration for analyzing the data. All the data has been converted into % of total scores factor wise given by 200 officers/managers. There has been another factor as membership of officers / managers for OA’s in banks was analyzed to know the extent of participation in OA activities in banks.

Showing Table Wise and Graph Wise, all six demographic factors and membership for OA’s as------

Table 1:- Showing % of Age factor category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>A</td>
<td>131</td>
<td>65.5%</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>54</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>25</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

Graph 1:- Showing % of Age factor category wise in banking

Table 1 along with Graph 1 shows three categories A, B & C concerning age factor. Where category A (Above 50 years) shows that 65.5% officers/managers are active in OA activates, whereas category B (40-50 years) got 27 % and category C (below 40 years) got 12.5 % part in OA activities in banking sector.
Table 2: Showing % of Promote/Direct Recruits category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote / Direct Recruits</td>
<td>A</td>
<td>145</td>
<td>72.5%</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>55</td>
<td>27.5%</td>
</tr>
</tbody>
</table>

Graph 2: Showing % of Promote/Direct Recruits category wise in banking.

Table 2 and Graph 2 showing two categories A (promote) and B (Direct Recruits) concerning the factor as Promote / Direct Recruits. This shows clearly that 72.5% Officers/Managers are of promote in nature where only 27.5% Officers/Managers are direct recruits taking part in OA activates in banking sector.

Table 3: Showing % of Work Experience category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Experience</td>
<td>A</td>
<td>108</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>64</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>28</td>
<td>14%</td>
</tr>
</tbody>
</table>

Graph 3: Showing % of Work Experience category wise in banking

Table 3 Graph 3 shows the third factor as Total Work Experience where three categories taken into consideration as category A (Above 30 years) got 54% share and category B (20-30 Years) score 32% with category C (Below 20 Years) scoring too low as 14% in banking sector.

Table 4: Showing % of Educational Level category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>A</td>
<td>146</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>35</td>
<td>17.5%</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19</td>
<td>9.5%</td>
</tr>
</tbody>
</table>

Table 4 & Graph 4 showing Educational Level factor where there categories taken in consideration as category A (Graduate) maximum which scores of officers/manager as 73% compared to category B (Post Graduate Scoring) 17.5% and category C (MBA) with 9.5% having participation in OA activities in banking sector.
Graph 4: Showing % of Educational Level category wise in banking

Table 5: Showing % of Family Class category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Class</td>
<td>A</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>158</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

Graph 5: Showing % of Family Class category wise in banking

Table 5 & Graph 5 showing the factor of Family Class where again three categories taken as category A (Upper Class) category B (Middle Class) and category C (Lower Class). Where category A (Upper Class) scored 26 % and category B (Middle Class) got 79 %, which shows very high level of participation of officers/manager in OA activities but category C (Lower Class) scored only 8%, which is very low in terms of OA activism.

Table 6: Showing % of Designation / Position category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>A</td>
<td>49</td>
<td>24.5</td>
</tr>
<tr>
<td>/ Position</td>
<td>B</td>
<td>106</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>45</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Graph 6: Showing % of Designation / Position category wise in banking
Table 6 and Graph 6 showing three categories A, B, & C concerning the Designation/Position factor. Category A (Chief Managers) shows 24.5 %, along with B (Middle Managers) with 53% and C (Officers/Executives) with 22.5 % participation in OA activities.

Table 7:- Showing % of Membership for OA’s category wise in banking

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Score</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membership</td>
<td>A</td>
<td>179</td>
<td>89.5%</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>21</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

Graph 7:- Showing % of Membership for OA’s category wise in banking

Table 7 & Graph 7 showing % of membership in OA’s. This clearly shows that there are two categories as A & B. Category A shows 89.5% participation of officers/managers for membership in OA’s where only 10.5 % showing non-membership participation in OA activities.

5. CONCLUSION

The present study has been conducted in the banking sector, which is known for its contribution to the National Economy. This sector is also perceived as a backbone of any country either developed or developing. This study is also an effort to know how the demography of officers/managers is contributing to managerial unionism and how membership for OA’s affecting the functioning in banking sector.

The result analysis clearly showing very interesting findings for six demographic factors and also shows a clear cut decision about the membership scenario for OA’s. Analyzing the first factor as age, this has three categories A, B and C. Where graphical comparison explains that officers/managers category A (Above 50 Years) dominates in terms of participation in activities. Thus, we conclude that those officers/managers have spent maximum number of years in various positions, are now taking active part in OA’s activities and functions. This finding, we can collaborate with the second factor as promote/direct recruits. Promote officers/managers are again dominating with almost two third majority in performing OA activities. The third factor total work experience also supports the first & second factor findings, where more than 50% officers/managers related to category A (Above 30 Years) are participating in OA activities. This means that if we combine three factors, we can conclude that officers/managers with maximum age having more & more experience with promote criteria is taking very active part in OA activities comparing to those having less age, experience and are direct recruits for managerial class. The fourth factor as educational level, where findings clearly show category A (graduates) dominates with almost two third officers/managers are taking active part in OA activities. The fifth factor family class been analyzed, where three categories been seen as how the class classification is affecting managerial unionism. It has been found that nearly 80 % officers/managers from category B (middle class) taking active part in OA activities. This shows that this particular class is working like sandwich across the sectors and trying to find their identity amongst all other classes. It has been seen that majority of officers/managers of this class represent a huge strength especially in banking sector. This finding can be supported by the analysis of sixth factor as designation/position, which also shows clearly more than 50 % managers are from middle management who are taking active part in OA’s functioning and activities.

It was very interesting to see the conclusion of membership percentage, where this is clearly showing around 90 % officers/managers are having membership for OA’s. It is quite surprising to see the data as even senior managers are also associated with OA as members and some of them taking part in day to day functions. This, we can conclude as collective bargaining is playing active role in managerial unionism.

In climax, analyzing all these demographic factors, we conclude as officers/managers possessing maximum age, experience with a graduate qualification belonging to middle class and working at middle management level with
Satish C. Sharma

a promote tag are aspiring for to be a member of OA’s and take very active part in OA activities and functions. Thus, we can say that officers/managers are intended to promote managerial unionism in banking sector.

In personal view as a researcher, the demography of these officers /managers is certainly affecting managerial unionism in Indian banking Industry.

REFERENCES

ABSTRACT

As technology continued to progress, shopping became easier. In this light we can define social media as “internet-based applications that are built on the ideological and technological foundations of Web 2.0 and they allow the creation and exchange of user-generated content” (Kaplan and Haenlen 2010). On the other hand, Consumer behavior is the study of individuals, groups, or organizations and the processes they use to select, secure, and dispose of products, services, experiences, or ideas to satisfy needs and the impacts that these processes have on the consumer and society. Social media websites nowadays have become a platform for consumers (youth) and companies to interact with each other in a coherent and accessible way. Thus, consumers, especially the upcoming generations, can access information from social media, about goods and services to a great extent. This has resulted in the emergence of that set of consumer who exercises his/her power of making a rational purchase.

The purpose of this study is to examine the effects of social media technology usage among the students of Delhi University and further study how it affects the behavior of those consumers. The study aims to understand that how the usage of internet and other new technologies continue to pay a big role influencing the youth market, particularly the students of Delhi University. Also, this study will assess the positive and negative effects of social media on consumer behavior especially on the students of Delhi University. Through the study of latest literature on this topic, variables will be decided for changing consumer behaviour and the linkage with digital upcoming. This descriptive research will be based on primary data collection which will be collected by using questionnaire as a tool for carrying out the survey. The survey will be done to obtain responses from the students of Delhi University. Thereafter, the accumulated data should be analysed using statistical tools.

Keywords: Social media, Consumer Behaviour, Social Media Technology, Delhi University, youth market

1.1 RESEARCH BACKGROUND

According to Ioanas and Stoica (2014) the online environment is viewed by users from a new prospect in a commercial way in present years. Its growth and the development of online stores have turned users into customers. Also the most essential role of social media as altered the way of how marketers and customers interact. The impact of informational society causes the processes of consumer decision and evaluations of product. Hennig-Thurau et al (2004) has stated that social media offers a new channel to acquire information of product through peer interaction. Moreover by using social media customers have the power to impact other buyers through services or product reviews used.

Mangold and Faulds (2009) has stated that customers are also impacted by other psychosocial impacts like buying motivation, income, presentation of an organization, brand or organization presence on social networks, demographic variable (sex, age, disposable wages, etc), workplace method of payment types of stores, etc. Blyth (2008) has mentioned that consumer behavior is referred as the activities which people carry out when acquiring, disposing and consuming of services and products.

Consumer behaviors are influenced by environmental and personal factors. Solomon et al (2010) has mentioned that the major part of consumer behavior is purchasing decision of consumers that involve numerous steps. Usually social media such as individuals or groups who own the power over customers can influence purchase decision of consumers. Heinrichs, Lim and Lim (2011) has mentioned that social media offered facilities for customers to communicate with one another, to review, comment, access to information and rates that can support them for buying decisions in varied ways. Manyika et al (2011) has mentioned that enormous number of social media campaigns, electronic commerce websites, forums, sales electronic mails, etc. appears that all size firms have been translating their approaches of marketing to internet because of its accessibility to their target audience and the money needed to perform so. Internet provides favorable solutions to marketers nowadays. The below figure shows the % of online adults who use social media websites by year: From the above figure it can be understand that in a survey organized in 2014 September the Pew Research Centre predicted that Facebook remains by far the most familiar social media site. While its development has reduced the user engagement level with the platform has developed. Other platforms
like Instagram, Twitter, LinkedIn and Pinterest saw essential growth over the past year in ratio of online adults who now utilize their sites (Duggan et al, 2015).

According to Dan Power (2011) YouTube and Facebook which are simple to use online tools have resulted exponentially in a rise in connectedness. He states that these alterations in these technologies and tools will outcome in making consumer decision making much rational and effective. The features of social media sites are such that they enhance customers to visit varied pages of facebook and communicate with perspective purchasers and read comments and reviews of customers making buying simpler and much satisfactory for them. Drury (2008) has stated that marketing through social media would be an alternative prospect of interfacing with individuals and yet the most influential applications of social techniques in worldwide economy are untapped largely. Social media puts customers back to the centre of business world and offers marketers a new group of tools to communicate with customers and to integrate them into brands through innovative ways. Marketers have to perceive how social media has impacted consumer behavior. Thus it can be inferred that online presence has become a leading determinant of firm’s success in 21st century which will attract internet savvy consumers and employ them through social media use in ways which will lead to generation of positive response from them.

1.2 PROBLEM STATEMENT
Technology gives customer the power to examine products to label them and criticize them in common measure and more. The growth of social media around the world has made a new place of communication and interaction among people. Individuals can share their views, experiences and knowledge with one another due to the various features of social media and may have an effect on consumer behavior in terms of buying and communication. Therefore several firms nowadays have social network pages to complement the information held about products, held by customer’s feedback about products and tend to associate much to a firm after reading different views. The websites of social media have become a platform for customers and corporations to communicate with each other in a lucid way with an estimated one billion membership. The effect of social media on customer behavior has been huge. An average user of internet has 669 social ties where Facebook has greater than 600 million daily active users with over 2 million business pages and 30 billion content pieces shared on monthly basis (McKinsey, 2011). Similarly LinkedIn has greater than 225 million professionals globally involving entire Fortune 500 firms. The global average time invested by an individual on social media sites is 7 hours/month (Delaney and Salminen, 2012). Thus, due to social media changes in consumer behavior are one of the most intriguing perspectives in marketing. This study aims to analyze the impact of social media on consumer behavior.

1.3 AIMS AND OBJECTIVES OF THE STUDY
1.3.1 Aim:
The main aim of the study is to analyze the effects of social media use among the students of Delhi University and how it effects their consumer behavior.

1.3.2 Objectives:
rapy  To understand the Social Media Usage pattern among the Delhi University students.
rapy  To examine the role of social media on consumer behavior in the modern world
rapy  To assess the positive and negative effects of social media on consumer behavior

1.4 Research Questions: The research questions of the study are:
1) What is the usage pattern of social media among Delhi university students?
2) What is the role of social media on consumer behavior in the modern world?
3) What are the positive and negative effects of social media on consumer behavior?
1.5 Limitations of Research:

i) This study is limited to Delhi only.
ii) This study is limited to students.
iii) This study evaluates the effects of social media use among the students of Delhi University and how it affects their consumer behaviour.

2.1 LITERATURE REVIEW

This section discusses in detail about the existing studies related to the study on effects of social media technology on consumer behaviour.

Ioanăs and Stoica (2014) conducted a study in order to identify the impact of social media on consumer behaviour. Technology gives consumer the ability to identify the products and also to criticize them in their point of view. Today, several companies have social networks sites which make customers to give feedback and complement the information towards the products. Apart from these, most of the consumers provide reviews about the product. Author conducted a quantitative research and also collected sample data from 116 respondents in order to conclude the research. Author concluded the study by univariate and bi-variate analysis. SPSS was used in order to conduct the complex statistical analysis. The results of the study reveal that, social media impacts on the consumer in both positive and negative ways while purchasing the products.

Chaturvedi and Barbar (2014) conducted a study in order to identify the impact of social media on consumer behaviour. Social media technologies have become a platform for consumers and companies to interact with each other. Author identified that social media technologies creates various impacts on consumers and consumer shopping behaviour may also varies based on age, education and so on. Author stated that, buying decision of consumers is mostly affected by Facebook than any other social media technologies. Peoples spend lot of time on social media technology which affects their behaviour in interacting and sharing the information. The individual’s shopping behaviour are largely affected by emergence of social networks and this is due to the consumers shares about their shopping experiences, reviews about products, rating others’ reviews and also commenting about products. Author concluded that, consumers are more likely to accept the recommendations and reviews from their family members, and friends.

Thus, from the above studies conducted by Ioanăs and Stoica (2014) and Chaturvedi and Barbar (2014), it is clearly identified that, social media have ability to impact on consumers in both positive and negative ways, Thus, it is clearly identified that, social media technology provides both positive and negative comments on products which makes easier for the consumers in judging about the products.

O'Hara and Perry (2001) conducted a study and investigated about the shopping anytime anywhere. The main promise of emerging social media technologies and m-commerce are to act based on consumer needs anytime and anywhere. These technologies influence the shopping behaviour of consumers and flexibility of online shopping. Author presents the study in order to explore the m-commerce as shopping anywhere and also at anytime. Author collected the sample data from 16 respondents and also they are from different social class, age groups, family status, gender, occupation, educational level and income. The consumer behaviour and their wishes to buy the products in online make technologies and services to support their requirements and needs. In general, development of technologies makes consumers to collect the information about the products in online and judge the information. Apart from these, consumers can also buy the products anywhere and also at anytime.

Agarwal (2014) conducted a study in order to identify the factors that affect the online shopping behaviour of consumers, particularly with respect to Mumbai region. Online shopping is the one that provides all type of products to be available particularly in the virtual world. Author collected sample data from 200 respondents. The results of the study reveal that, online shopping trends are continuously increasing among the Indian consumers and this is due to the flexible shopping and time saving process. Thus, from the above studies conducted by O'Hara and Perry (2001) and Agarwal (2014) it is clearly identified that, social media technology offers the facility of shopping the products. Apart from these, it is also identified that, it is possible to buy the products at anytime and anywhere. Thus, it is clearly identified that, social media technology offers the facility of shopping products from anywhere and at any time to the consumers.

Jiang and Benbasat (2004) conducted a study in order to identify the virtual product experience and also about its effects of functional and visual control of products. Author stated that online shopping or shopping through social media technologies provides inability of consumers to touch or feel the products as they do it in the conventional store shopping. Visual control makes customers to manipulate the product images on web, to view the products from different distances and angles and the functional control makes consumers to experience and explore different functions and features of the products. Author concluded that, customers cannot able to touch and feel the products while shopping through online.
Thus, from the above studies conducted by, Jiang and Benbasat (2004) and Sascha, Kilian, and Daniel Brylla (2014), it is clearly identified that, it is not possible to touch the products while buying the products in online and this is due to virtually shopping. Thus, it is clearly identified that, social media technology does not give touch and feel experience while buying the products through it.

3.1 RESEARCH METHODOLOGY

This chapter gives an overview of the research approach, design, sampling design, data types, data collection and interpretation methodologies involved in conducting the research and the statistical tools used to test the proposed research hypothesis.

3.1.1 Research Paradigm:

This study adopts positivism as the research paradigm. Weber (2004) has defined that positivism is an ontological and philosophical position in which there can be something which is known, truthful or positive. The positivism concept is associated directly with the objectivism idea. The scientists give their opinion to evaluate social world with the help of objectivity in the place of subjectivity in this type of philosophical approach. Positivism researchers are interested to gather general data and information from a huge social sample instead of focusing research details. This study adopts positivism since it verifies a hypothesis of research by examining numerical data collected from primary respondents.

3.1.2 Research Approach:

This study adapts quantitative research. Adcock, Robert, and Collier (2001) defined that quantitative research has its origin in its natural sciences. Quantitative research depends upon measurement and uses different scales. Quantitative research uses mathematical analyses and numerical data often from big representative samples. Quantitative research is descriptive in nature. Quantitative research has its roots in positivism and is more closely associated with the scientific method than is qualitative research. This study uses quantitative approach since the researcher gathers data using statistical analysis.

3.1.3 Research Design:

This study adopts descriptive research design. De-Marrais, Kathleen and Lapan (2004) have described that descriptive research as the name suggests describes descriptive data about the population being studied and does not try to set up casual relationship between events. It is used to explain a happening, an event or to offer accurate and factual description of the population being studied. This study adapts descriptive research design since it examines the technical and ethical problems related to social media impact on consumer behavior.

3.1.4 Sampling:

This study adapts simple random sampling. According to Collins et al (2007) a simple random sample is the subset of a bigger population created in such a way that every population element has common probability of being chosen to the subset. The procedure for drawing a sample to satisfy the simple random sampling definition is referred to as simple random sampling. This study uses simple random sampling for quantitative analysis since it is perfect for conducting statistical analysis. The sample size is 120 students from Delhi University.

3.1.5 Data Collection:

According to Somekh and Lewin (2005) primary data is collected directly from the researcher for some specific purpose or study. Primary data is collected using questionnaire based survey. Similarly Maxwell and Loomis (2003) has mentioned that secondary data the information which already occurs in some form or another but which was not gathered primarily for the need of data at hand.

3.1.7 Data Analysis and Interpretation:

The effort and the time needed for data analysis and interpretation rely on the study’s methodology and purpose used. Analysis and interpretation may take from many days to many months (Pervez and Gronhaug, 2011).

3.1.8 Statistical Tool:

The statistical tool used in this study is Pearson correlation co efficient. The software employed in analyzing the primary data collected is Microsoft Excel.

4. DATA ANALYSIS AND HYPOTHESIS TESTING

4.1 Introduction

In this section, the hypothesis testing is done on the data collected from the primary respondents. Various criteria based on questionnaires collected from 120 students are tabulated and analyzed to study the effects of social media
use among the students of Delhi University and how it affects their consumer behavior have been presented in appendix B [Refer Appendix B]. The hypothesis testing done using Pearson correlation coefficient test is presented below

4.2 Hypothesis testing

4.2.1 Hypothesis 1

NULL HYPOTHESIS Ho: Social media technology does not provide both positive and negative comments on products which makes easier for the consumers in judging about the products

ALTERNATIVE HYPOTHESIS H1: Social media technology provides both positive and negative comments on products which makes easier for the consumers in judging about the products

(Q1) Use of social media technology to buy products Vs. (Q4(B)) Social media technology provides both positive and negative comments on products for judging the same

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
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<td>1</td>
</tr>
<tr>
<td>Agree</td>
<td>44</td>
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<tr>
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<td>2</td>
<td>1</td>
</tr>
<tr>
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</tr>
<tr>
<td>Strongly disagree</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table: Test of Hypothesis 1*

Calculating the value of correlation coefficient using statistical calculator, the following result is obtained:

\[
R = \frac{n \cdot \Sigma xy - (\Sigma x \cdot \Sigma y)}{\sqrt{\left( n \cdot \Sigma x^2 - (\Sigma x)^2 \right) \left( n \cdot \Sigma y^2 - (\Sigma y)^2 \right)}} = 0.62
\]

*Inference*

The value of correlation coefficient “r”, obtained using the statistical calculator is **0.62**. Hence the null hypothesis is rejected and the alternate hypothesis, “Social media technology provides both positive and negative comments on products which makes easier for the consumers in judging about the products”, is accepted.

4.2.2 Hypothesis 2

NULL HYPOTHESIS Ho: Social media technology does not offer the facility of shopping products from anywhere and at any time to the consumers

ALTERNATIVE HYPOTHESIS H1: Social media technology offers the facility of shopping products from anywhere and at any time to the consumers
(Q1) Use of social media technology to buy products Vs. (Q4(O)) Facility of buying products from anywhere and at any time

<table>
<thead>
<tr>
<th></th>
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</tr>
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<tr>
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<td>29</td>
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<td>Neither Agree/ Disagree</td>
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<td>1</td>
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<td>Disagree</td>
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<td>0</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Table: Test of Hypothesis 2

Calculating the value of correlation coefficient using statistical calculator, the following result is obtained:

\[ R = \frac{n \sum xy - (\sum x \sum y)}{\sqrt{(n \sum x^2 (\sum x)^2) (n \sum y^2 (\sum y)^2)}} = 0.88 \]

Inference

The value of correlation coefficient “r”, obtained using the statistical calculator is 0.88. Hence the null hypothesis is rejected and the alternate hypothesis, “Social media technology offers the facility of shopping products from anywhere and at any time to the consumers”, is accepted.

4.2.3 Hypothesis 3

NULL HYPOTHESIS Ho: Social media technology does not give touch and feel experience while buying the products through it

ALTERNATIVE HYPOTHESIS H1: Social media technology gives touch and feel experience while buying the products through it

<table>
<thead>
<tr>
<th>(Q1) Use of social media technology to buy products Vs. (Q5(C)) Touch and feel experience while buying the products</th>
<th>Yes</th>
<th>No</th>
</tr>
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<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table: Test of Hypothesis 3

Calculating the value of correlation coefficient using statistical calculator, the following result is obtained:
Figure: Test of Hypothesis 3

\[
R = \frac{n\Sigma xy - (\Sigma x, \Sigma y)}{\sqrt{(n \Sigma x^2 (\Sigma x)^2) (n \Sigma y^2 (\Sigma y)^2)}} = -0.95
\]

Inference

The value of correlation coefficient “r”, obtained using the statistical calculator is \(-0.95\). Hence the alternative hypothesis is rejected and the null hypothesis, “Social media technology does not give touch and feel experience while buying the products”, is accepted.

5. DISCUSSION

5.1 Introduction

The chapter discussion elaborately presents the entire study. The focus of the study was to examine the effects of social media technology on the behavior of consumers with specific reference to the students of Delhi University. A detailed analysis of the usage of internet and other new technologies and about how they continue to pay a big role influencing the youth market is also achieved in the study. Further, the study proposed 3 hypotheses and analyses them in depth by conducting quantitative analysis to infer efficient results. The primary data for analyzing the effects of social media use among the students was collected from 120 students of Delhi University by conducting a survey. The questionnaire framed to collect the primary data focused on analyzing if the social media technology provides both positive and negative comments on products or not for the consumers to judge the products; if the social media technology offers the facility of shopping products from anywhere and at any time or not and if the social media technology gives the touch and feel experience while buying the products or not.

5.1.1 Personal Details of the respondents:

From the results obtained from the analysis of primary data, it can be inferred that, a maximum number of respondents belonged to the age group 17 to 20 years and were observed to be equal number of male and female. Most of the respondents were users of social media technology for buying products for more than 5 years and agreed that the social media technology plays important role in attracting customers towards the products.

5.1.2 Positive effects of social media technology on consumer behavior:

From the analysis it can be observed that most of the respondents agree that the social media allows them to compare the features of various products; provides both positive and negative comments which make easier to judge about the products; provides the ability to obtain valuable information on brands and products on social media technology and provides the ability to find similar products from various brands which makes them to choose right product. Further, it can also be observed that most of the respondents agree that the information obtained from social media is trustworthy and state that the social media technology used and the friends on social media are trustworthy. Most of the respondents are also observed to share experience with friends about acquiring information and buying products on social media technology and such practices enable them get more genuine information on social media technology. Regarding the convenience in shopping, most of the respondents stated that, the social media technology makes them to shop easier through online and make their products delivered at home. In addition they also stated that it enables them quickly browse the information and product required and that it enables them find many people of the same interest on social media technology which makes them happy. A maximum number of respondents were observed to have claimed that the social media technology offers them shop the products from anywhere and at any time. About the perceived risks the respondents stated that there is a considerable financial risk in buying products through social media technology and that there is a probability of getting poor quality products through social media.
technology. Most of them agreed that the probability of wasting a lot of time on buying products through social media technology is low; probability of getting under social pressure while purchasing the products through social media technology is low and that, the probability of harming psychological and physical health by purchasing products through social media technology is low. Further, it can also be observed that most of the respondents agree that, they find products that are more suitable for their personal styles and quality on social media technology; they save a lot of energy acquiring information about products on social media technology; they acquire information about products on social media technology, and they know that their quality is better; they save a lot of time while buying the products through social media technology and that they find right products and also with cheaper price.

5.1.3 Negative effects of social media technology on consumer behavior:

From the analysis it can be observed that most of the respondents agree that the social media does not make it possible for them to touch the products while shopping; it is not possible to experience touch and feel while buying the products through social media technology; it is not possible to identify the quality of products before buying and further, some also claimed that, there is no feel of satisfaction while shopping through social media technology.

Further, it can also be observed that most of the respondents state that, while using social media technology they get more information about products which makes decision making complex; it is very difficult to search one product from several similar products and that, it is very difficult to choose one right product from several similar products. In addition, many stated that, both the negative and positive views about one product makes them to confuse while shopping. Regarding the basic knowledge of social media technology, most of the respondents were observed to agree that it is not possible to buy the product without basic knowledge about product and its information and that buying the product is not possible without having knowledge about social media technology, the brand experience and the brand awareness. About their worst experience of the social media technology, most of the respondents were observed to agree that, their previous experience about quality; the damages in the products; the false information about the products and the high price for low quality makes them not to buy the product through social media technology.

5.1.4 Reasons for using social media technology for shopping:

In addition, regarding the reasons for using social media technology for shopping, a number of reasons were stated by the respondents such as, the social media technology is more reliable than the traditional advertising and that obtaining the valuable information about products is easy on social media technology. The respondents also claimed that, exposure to product information influences more while buying the products from the social media technology. The study infers that, most of the respondents are satisfied with buying the products through social media technology and that the social media technology helps in decision making process while buying the products, giving a lot of information about the products and enabling them to compare various features of product while buying. Thus, it can be observed that, the social media technology helps the consumers to choose the right product.

6. CONCLUSION

The chapter conclusion presents the key findings of the study. The current study was focused on examining the effects of social media technology on the behavior of consumers. Most important of all the effects caused by the social media technology, three hypotheses such that, if the social media technology provides both positive and negative comments on products or not for the consumers to judge the products; if the social media technology offers the facility of shopping products from anywhere and at any time or not and if the social media technology gives the touch and feel experience while buying the products or not were analyzed. Following are the findings from the study inferred from the primary and secondary data collected during the study. The social media technology is observed to incur both positive as well as negative effects up on the consumers and influence their buying decisions. The positive effects such as allowing the consumers compare the product features, coming across comments from the other product users and compare similar products from various brands are facilitated by the social media technology. The social media technology facilitates the users to share their experience about a product with others and these positive and negative comments which the consumers who are about to buy the product, come across in the social media allow them understand the positive and negative features of the product and this in turn is observed to enhance their trust in the use of social media technology for buying products. Thus, the alternate hypothesis proposed in the study, “Social media technology provides both positive and negative comments on products which makes easier for the consumers in judging about the products” can be accepted.

Among the advantages of using the social media technology to purchase products online, the facility to shop products from anywhere and at any time is observed to be most significant. The ability to browse for required products, compare them with other similar products and shop them easily is evidently provided by the social media technology. Even though there exist certain risks such as financial risks and probability of getting poor quality products, the social media technology offers positive effects such as providing right products at cheaper prices to the consumers.
from anywhere and at any time. Thus, the alternate hypothesis proposed in the study, “Social media technology offers the facility of shopping products from anywhere and at any time to the consumers” can be accepted.

6.1 Recommendations for future research

The present study takes into consideration only the students from Delhi University. Consumer behaviour being a broader area, the study can also be extend to different sets of respondents such as working people, unemployed people, aged people, etc. This study can also be conducted by collecting qualitative data in the form of interviews from the target respondents to identify the answers for the research problem in depth. Further this study can also be extended to other countries, since social media technologies have become an online market place for people all over the world, today!

REFERENCES


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LOAN LOSS RESERVES AS A TEST OF SOLIDARITY IN COOPERATIVES

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ABSTRACT

The cooperative structure traces its origin to Europe and is in existence for more than one and a half centuries. The structure rapidly expanded across the globe and encompassed all possible activities where there was a need for collective action. The collective need for banking resulted in the formation of financial co-operatives. These are usually non-profit and provide financial services to the members who come together for some common financial need. Due to the exclusion of certain section of the society from the mainstream banking, they became an important structure for addressing financial inclusion and poverty alleviation. Though the cooperative structure offers lot of advantages over other institutional forms, the key to success of cooperative lies in participation and solidarity. This paper deals with a part of the experimental project of a microfinance institution in India that targeted income generating poor above the subsistence level. The main focus of the project was to test the feasibility of cooperative structure in the target segment and for this a special tool was determined to measure the feasibility. This was called the Loan Loss Reserve. This paper presents the result of a Focus Group Discussion conducted online in 2012 involving experts from the field of microfinance. The findings are quite significant for practitioners as well as researchers because loan loss reserves may test the sustainability of the cooperative structure for meeting the financial needs of this segment of poor population.

Keywords: Cooperatives; Microfinance; Poverty alleviation; Sustainability; Focus Group Discussion

JEL: A1; D53; G23; I32; M14; P13

1. INTRODUCTION

The fact that the Indian microfinance sector is full of opportunities and the need for innovations is undeniable. Financial inclusion and development are complementary to each other and the positive effects of the development at any level of economy are bound to percolate to the bottom. The cooperative method of financing fulfill the criteria to qualify as a wholly participatory mode of finance. However the basis of cooperative is democratic structure and participation of all. It is easier said than done to implement in entirety the basic principles of a good cooperative as envisaged in the rules of International Cooperative Alliance¹. The starting point of a successful cooperative is the sustainable association of individuals for a common need. This action research was intended to basically test if the intended cooperative method of financing with unique features shall sustain or not. The research was undertaken by a start-up microfinance institution that facilitates the formation of cooperative based microfinance for the individuals just above the subsistence level. This target segment engages in income generating activities and belong mainly to the unorganized sector. The basic aim of the research was to test if the members are willing to engage in profit-loss mode of transactions that require assuming the risk of the other borrowers. A concept of loan loss reserve (LLR) was introduced in the group mechanism to test if the members are prepared to venture into the sustainable mode of profit-loss sharing or the venture fund method of financing. This paper deals with the results of a focus group discussion (FGD) conducted to assess the feasibility of the concept of LLR in cooperative based microfinance.

2. THEORETICAL FRAMEWORK

Building on what works in the informal system, many forms of member-based financial organizations exist throughout the world. Credit unions or savings and credit cooperatives are more formal, whereas other organizations border on informal, although usually with more formal organizations behind them as promoters. A co-operative is a business owned and controlled by the people who use its services, and who, by working together, can reach an objective unattainable by acting alone. It is a form of business enterprise, organised on a voluntary basis, democratically controlled and member-owned, to variously meet the economic, social, and cultural needs of its members. The World Council of Credit Union (2003) lays down two key conditions for financial cooperatives to be

¹ http://ica.coop/en/whats-co-op/co-operative-identity-values-principles
successful: (1) the number of members must be small enough so that they can monitor each other easily (or systems similar to those found in formal financial institutions must be put in place to protect depositors), but large enough to ensure that (2) a single group of net borrowers does not dominate. Harris et al analyse the new generation cooperatives to establish the cooperative theories. Khan et al studied the impact of cooperative microfinance on the lives of the poor. Cooperative is not expected to address all the issues and problems. Through cooperatives it is possible to produce and distribute high quality food at reasonable prices. Cooperatives can also vindicate concern for the environment. They can fulfill the object of distributing economic power more widely and fairly. Cooperative is expected to empower communities in which they are located. They can assist people, capable of helping themselves, escape poverty. They can assist in bringing people with different cultures, religions and political beliefs together. The statement of cooperative identity must be seen within historical, contemporary and future context. (Ajmal, A; Interest Free Microfinance in India: Exploring the cooperative model option). How social capital works in a cooperative is very important. “Analysis of this question leads to the idea that in contrast to markets and hierarchies, internal coordination and resource allocation in cooperatives is primarily determined by the quality of interpersonal relations between its members. The better is the personal relationship that the members developed with each other, the more flexible and smooth will be the processes of communication, coordination, and collective decision making. The planning of future joint business activities and adaptation to unforeseen contingencies all depend on the degree of mutual understanding, trust, and personal sympathy existing between the members. It can be proposed therefore that the economic principle of cooperative organisation is social capital shared by its membership; social capital performs the same organisational role for cooperatives as price and authority relation – respectively for markets and hierarchies. Consequently, cooperatives can be regarded as representing the social capital-based organisation.

Informal sector in India is broadly characterized as consisting of units engaged in the production of goods and services with the primary objectives of generating employment and incomes to the persons concern. These units typically operate at low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. (http://labour.nic.in/ss/INFORMALSECTORININDIA-approachesforSocialSecurity.pdf). As a measure of its importance, in India, nearly 60 percent of the national income is generated in the unorganized (informal) segment (Kulshreshtha and Singh, 1998). There are two kinds of informal sector enterprises (Review of Income and Wealth, Series 57, Special Issue, May 2011).

- **Informal own account enterprises** are owned and operated by own account workers. They may employ contributing family workers and they may also have paid employees but only on an occasional basis. Depending on national circumstances, either all own account enterprises may be defined as informal or only those which are not registered with the tax authorities, the statistical agency or other government body.

- **Enterprises of informal employers** employ one or more employees on a continuous basis and depending on national circumstances they are defined as informal according to one or both of two criteria: number of employees and non-registration of the enterprise or its employees. National Accounts Statistics (CSO, 2008) has identified nine broad categories of unorganized sector in India. Which are: Agriculture, forestry & fishing, Mining & quarrying, Manufacturing, Electricity, gas & water supply, Construction, Trade, hotels & restaurants, Transport, storage & communication, Financing, insurance & real estate and Community, social & personal services.

On the basis of 2004-05 NSSO data, the commission has estimated that 15 percent (67 million) of the countries workforce is employed in the organized sector while the remaining 85 percent (390 million) is in the unorganized sector. About 7 percent of those employed in the organized sector have been identified as informal workers without any job security (no protection against arbitrary dismissal), employment security (no protection against accidents and illness at the work place) and social security (maternity and health care benefits, pension etc). Thus, about 92 percent (422 million) workers are in the informal/unorganized economy.

At this point of introduction of the social capital concept into our argument it is necessary to briefly address the issue of defining the concept. As the review of the extensive literature on social capital testifies, its definitions are diverse, numerous, and revealing various important aspects of the concept. Whereas no definition of social capital seems to be generally accepted, most of them contain references to norms, values, relationships, connections, networks as the characteristic features of social capital. In order to classify these diverse components, Grootaert and Bastelaer draw a methodological distinction between the two forms of social capital – structural (established roles, social networks and other social structures) and cognitive (shared norms, values, trust, attitudes, and beliefs). However it seems more appropriate to differentiate between the contents and form, rather than between two kinds of form. Social capital can therefore be defined as norms, values, and trust embodied in the specific structural forms (e.g. cooperatives, networks, associations, groups etc.). An insightful comparison is that the cooperative or other structure stands in the same relationship to social capital, as the business firm to physical or financial capital, or the individual to human capital. Contents and form are always inseparable; only in their unity they will be thought to constitute social capital.” (Valentinov 2004)
Cooperative and Social Capital


<table>
<thead>
<tr>
<th>Governance instrument</th>
<th>Main effect</th>
<th>Explanatory remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary membership</td>
<td>Anti-hierarchisation</td>
<td>Social capital can be built only on the basis of voluntary approaches; hence, practising them promotes social capital as alternative to hierarchical authority, which replaces voluntary action by directed one</td>
</tr>
<tr>
<td>Open membership</td>
<td>Anti-commercialisation</td>
<td>A distinctive characteristic of social capital is that its stock does not shrink if it is shared by an additional person; therefore the size of membership can be indefinitely expanded with the effect of extending the beneficial economic effects of cooperation on all those who share the same norms and rules which constitute the essence of a given local social capital</td>
</tr>
<tr>
<td>Democratic control</td>
<td>Anti-hierarchisation</td>
<td>The uniform voting rule reflects the fact the amount of social capital is determined by the number of personal identities of its individual bearers; each bearer can have only one identity; therefore practising this voting rule is a direct expression of social capital as the organisational principle</td>
</tr>
<tr>
<td>Limited compensation on capital</td>
<td>Anti-commercialisation</td>
<td>This ‘repressive’ measure is evidently intended to keep down the incentives to build ‘economic’ capital through the cooperative, and in this way prevent the penetration of ‘price-based’ organisation into the cooperative governance, which would destroy the stock of social capital</td>
</tr>
<tr>
<td>Autonomy, independence</td>
<td>Anti-hierarchisation</td>
<td>This governance characteristic also reflects the importance of voluntary approaches and prevents any attempts of hierarchical authority to occupy the place of social capital</td>
</tr>
<tr>
<td>Education, training, and information</td>
<td>Investment in social capital</td>
<td>These measures are directly intended at strengthening the internal stock of social capital by promoting the respective norms, values, and rules, and also increasing social capital of cooperatives in the eyes of the general public</td>
</tr>
<tr>
<td>Cooperation among cooperatives</td>
<td>Investment in social capital</td>
<td>Since all cooperatives are supposed to share a set of common values, they have a basis for developing a certain social capital between themselves, and it would be rational for them to use this opportunity, taking into account that it would also reaffirm social capital as the major organisational resource of cooperatives</td>
</tr>
<tr>
<td>Concern for community</td>
<td>Investment in social capital</td>
<td>This measure is intended in building social capital in those communities where cooperatives are located, rather than only between the members or with the general public.</td>
</tr>
</tbody>
</table>


3. THE PILOT PROGRAMME

The pilot programme included the testing of the formation of groups of income generating activities. These groups of IGAs were named as Business Cooperation Groups. The groups were required to conduct their financial transactions (saving and lending) under the supervision of the representative of the MFI. The group was supposed to serve as a miniature of the cooperative institution. A comprehensive study of these groups includes their position before and after joining the group. The impact on their business and profits were also to be assessed. However in this paper, only one aspect of this group formation is discussed. This aspect is the idea of Loan Loss Reserve (LLR). LLR is a fixed amount of money a depositor has to pay for the loss of loan. In a way it is a collateral. At a broader level, the groups were required to collect deposits and lend, education, learn accounting, and consult each other to improve their businesses. The main challenge for the researchers was to develop the interest of the target members and sustain them. The loan was to be given only for the income generating activity and no interest was to be paid on the savings collected. The borrower had to just repay the amount borrowed and all the members were supposed to contribute to LLR that was voluntary.
Factors for Selection of members of a group

- The members shall belong to the selected area.
- Homogeneity in income level.
- Engagement in any income generating activity.
- A minimum daily deposit by each member.

Structure of the Group

- A single group will consist of 11-19 members.
- The group members shall be located in the same market place.
- There will be 50-75 groups resulting in about 1000 members in a place within a radius of approximately 5 km.
- The members shall elect the daily collector and the joint custodian of the key.
- The members shall decide about the savings, loan disbursement and the decisions with regard to repayments.
- The group would engage in a way that the members develop a sense of solidarity and empathy for each other.

Weekly Meetings

- Weekly meetings to be conducted for about 45 min. duration at a fixed time.
- Weekly accounts will be presented in the meeting.
- Transactions –Deposits, withdrawals, loan & repayments- will be conducted at the meeting.
- The members must be educated on various issues of finance and business in each meeting.
- They must be involved in games and interactive learning to educate them about co-operatives, problem solving, etc.
- Any issue or conflict among the members must be solved in the meeting.
- Each meeting should have a set agenda decided in the last meeting.
- The minutes of each meeting must be recorded.
- Each meeting must result in a deeper understanding of the businesses and occupation of each member.
- Each member must be allowed to explain their business issues.
- Members will meet weekly in a certain place on certain time.

Liquidity Management

The decision on the amount of loan to be disbursed and retained deposits shall rest with the group. However, they shall be informed about the consequences of the various liquidity positions and the withdrawal liabilities. The different liquidity position shall help frame a sound liquidity policy for the co-operatives.

4. RESEARCH METHODOLOGY

The main objectives of this stage of the research is to test the feasibility of LLR in cooperative based microfinance. A panel of experts that included researchers, practitioners and policy-makers were asked to provide their opinions on the feasibility of this concept. Since the microfinance institution is at its conceptual stage, the research is actually a pilot programme for the institution. In order to receive a broader perspective on the issue, FGD by experts (Discussants) was deemed the best method for this research. The details of the research and the LLR were posted on social media groups dedicated to microfinance. In response to the questions 16 experts provided their detailed views. These views have been analyzed to conclude if this method is feasible and what challenges may occur in the course of its implementation.
**Profile of the Discussants**

<table>
<thead>
<tr>
<th>Discussant No.</th>
<th>Location</th>
<th>Institutional Affiliation</th>
<th>Designation</th>
<th>Online Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Germany</td>
<td>Not Provided</td>
<td>MicroBanking Consultant</td>
<td>Wall Street Microfinance Alliance</td>
</tr>
<tr>
<td>D2</td>
<td>USA</td>
<td>About Microfinance.com</td>
<td>Head</td>
<td>Wall Street Microfinance Alliance</td>
</tr>
<tr>
<td>D3</td>
<td>Netherlands</td>
<td>Brown Cow</td>
<td>Advisor</td>
<td>Microfinance Network</td>
</tr>
<tr>
<td>D4</td>
<td>Luxembourg</td>
<td>Not Available</td>
<td>Technical Counsellor</td>
<td>Boulder Microfinance Training 2010 - Turin</td>
</tr>
<tr>
<td>D5</td>
<td>Pakistan</td>
<td>USAID</td>
<td>Project Coordinator</td>
<td>Boulder Microfinance Training 2010 - Turin</td>
</tr>
<tr>
<td>D6</td>
<td>Ethiopia</td>
<td>Development Bank of Ethiopia</td>
<td>Vice President Credit Services</td>
<td>Boulder Microfinance Training 2010 - Turin</td>
</tr>
<tr>
<td>D7</td>
<td>Uganda</td>
<td>REMODE</td>
<td>Managing Director</td>
<td>Boulder Microfinance Training 2010 - Turin</td>
</tr>
<tr>
<td>D8</td>
<td>India</td>
<td>NABARD</td>
<td>Assistant General Manager</td>
<td>MFI Circle</td>
</tr>
<tr>
<td>D9</td>
<td>Kenya</td>
<td>Aroma Development Project</td>
<td>Not Available</td>
<td>MFI Circle</td>
</tr>
<tr>
<td>D10</td>
<td>Denmark</td>
<td>Self-employed</td>
<td>Rural Economist and Microfinance Specialist</td>
<td>Microfinance Professionals</td>
</tr>
<tr>
<td>D11</td>
<td>Kenya</td>
<td>Faulu Kenya Dtm limited</td>
<td>Head</td>
<td>Microfinance Investment Leadership</td>
</tr>
<tr>
<td>D12</td>
<td>France</td>
<td>Burgundy School of Business</td>
<td>Professor and Chair in Microfinance</td>
<td>Online Lending</td>
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<tr>
<td>D13</td>
<td>India</td>
<td>Sharp NGO</td>
<td>Project Coordinator</td>
<td>Micro Finance</td>
</tr>
</tbody>
</table>

5. **DISCUSSIONS**

**Acceptance of the concept**

In general the discussants opined that the introduction of LLR is an useful feature in the microfinance program. D2 mentioned that, "loan reserve for institutions engaged in small/micro loans sounds like a great idea and possibly long overdue". D11 also favored the idea and suggested to "pilot in an area with a good credit culture to avoid members of the group colluding to take advantage of the loan loss reserve. in which country will this experiment take place ". D13 had some other solution to propose instead of LLR. He mentioned that, " SHG people needs entrepreneurial trainings then only they can run business in success full manner"

**LLR and Social Capital**

There were some discussants who discussed about the creation of social capital. D3, notably, suggested that the "social capital can be generated by the common bond of the small/micro entrepreneurs participating in the project, which may serve as a mutual guarantee But the value of this guarantee is very difficult to capitalize. One suggestion could be a certain % the total of the net worth of the individual small/micro entrepreneurs participating in the project lets say 20% to start with. The % however, depends strongly on the dedication of the participating entrepreneurs.” On the other hand, D3 suggested a clarity in the relationship between LLR and social capital be established.

**Past Experiences**

D7 tried that method between 1997 - 2000. She fixed the LLR as 20% saving on the loan amount per individual in the group. She further stated that, "this led to the group breakage in that those who defaulted were paid for by the savings of those who were perfoming". D9 mentioned that they are registered community based organization and they have successfully implemented this concept of LLR.
Operational Aspect

Regarding the building up of reserves, D1 suggested that it should depend upon the expected arrears. It may be 10% of loan interest and the decision should be made regarding its voluntary/obligatory nature. An important suggestion made by D1 is the "reimbursement of half of the provision to the members who repay promptly". D2 explained that "typically, loan loss reserves are set up by financial institutions from profit generated by the institution and netted against gross loans." Therefore, LLR should be generated mainly by retained earnings. He further explained that "the management should carefully develop a strict assessment and monitoring systemic in order to keep loan losses low. For this purpose the PAR 30 method can be used". D5 clarified that LLR are, "usually created to observe unforeseen shocks to the business. Its % should depend on repayment behaviors of the borrowers and local micro economic conditions". He disagreed with D2 regarding the PAR 30. He suggested that, "there should be some general provisions on clean portfolio and % to PAR 30,60,90 and above". D6 suggested earmarking an amount as LLR and calling it a provision instead. D10 found difficulties in the accounting of LLR. He explained that LLR and collateral is getting mixed in the proposed experiment. Operationally he found it infeasible to collect savings and convert it into LLR.

Considerations

Many discussants offered their suggestions on what factors must be considered in implementing the idea. Firstly, D1 cautioned that the institution must differentiate between willful and natural defaults. D7 had concerned about the sustainability about the group cohesion. Therefore the institution must take care in the monitoring and management of the groups. D2 saw the LLR as an additional burden on the depositors. D4 supported the idea but suggested that this "guarantee fund" be fixed as a percentage of loan. D5 opined that, the "impact of this proviso should transfer to the borrowers not to members. If organization is already accumulate losses then organization needs restructuring in management or its business model". D10 provided an alternative solution to be considered. He said that, "collecting upfront savings and use them as pooled collateral would be an excellent idea".

6. CONCLUSION

The focus discussion group of experts largely support the view that LLR may be an important indicator of the sustainability of group that would later form a cooperative. There were differing opinions on the operationalization of the LLR. The microfinance institution trying to implement the idea of LLR must consider the fact the differing methods of operationalization may be appropriate in different contexts. Further the creation of social capital is an important dimension to be considered. The issue needs further probing but there is a strong indication that if the LLR can be sustained and measured, this may produce a sort of social capital. There are some critical considerations suggested by the discussants which if ignored may lead to the failure of the model. The group may fail to graduate into cooperative if these considerations are ignored.

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A Stakeholder Management Perspective in Small/Medium Organizations’ Using Agile Methods

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ABSTRACT

In many countries, the software industry is still in the nascent stage, consisting of small and medium SME’s (Fayad, 2000). It can also be said that software engineering is the backbone of all technological advancements presently happening everywhere. A key component of stakeholder management is common between the customer and development. It remains unfortunate that there is a common disposition to stress that the success of stakeholder management is rarely possible for small and medium software companies who employ Agile programming methods. Research literature has often highlighted that the main difference between large and small companies is the greater external ambiguity of the environment in which the small firm operates, along with the greater internal uniformity of its motivations and actions. To a large extent, this is dependent on the software stakeholders who are involved in the project. The number of individuals that constitute each software development teams will also be significantly reduced since these companies are small in size. This paper aims to understand the stakeholder management practice in such medium/small scale software organizations using agile methodology. The current project can be classified as a qualitative research due to its focus on qualitative data collection through interviews, observations and literature review.

Keywords: Stakeholder, Stakeholder management, Agile Methodology, Small and Medium scale industries

1. INTRODUCTION

The software industry has risen, developed and become a vital force over the last few decades and is seen as a major economic revolution all over the world. Likewise, small and medium enterprises are very important wheels in the gears of the world economy. In many countries, the software industry is still in the nascent stage, consisting of small and medium SME’s — (Fayad et al. 2000). These companies produce significant products, for whose making the firms need efficient software practices that are suitable for their particular size and type of business. Since the beginning of the 90s onwards, stakeholder management manages to hold a special interest in the software engineering community especially the researchers and industry. In order to survive this high-tech age, organizations need software to develop competitive products. A successful software project is the result of collaborative activities among different stakeholders including technical persons and all other project stakeholders including clients. (hall,t et.al,2002).

Fig 1: Stakeholder Management in Software SME adapted from (L.W.Smith, 2000)
Software development and building is a social activity which includes the customers, users, developers, managers etc who have their own roles in the operations and development of the project. In the present scenario esp. automotive, aircraft, space and defense industry, there is a need for rapid enhancement of product features. Here, different software’s play an important role along with complex electronic and mechanical hardware in doing such the same. In addition, complex systems very often comprise different types of software, (ISO, 2006). It was found that instead of money, the two main motivating factors for software engineers and other stakeholders in a SME utilizing Agile Methodology are the personal aspects of the work and includes “a sense of achievement, professional growth, satisfying work, delivered quality”. The second factor has a customer/user focus and can be described as “meets all customer/user requirements, customer/users are involved, and have realistic expectations”. Previous studies were divided as to whether software engineers form a homogeneous group with similar motivational needs. The majority of the research tends to support the idea that software engineers do form a recognizable group, e.g. [Hareton, Law]. Myers (Richardson L., 2001) refined the studies of Couger and Zawacki and colleagues to show that although software engineers form a distinct group, they vary among themselves by job type. More recent work that presents software engineers as a distinct group as [Hareton L., 2001]. Hence, one needs people with better levels of motivation and should be able to work independently as well as in a cohesive group. However, whether software engineers are different from or the same as other professional groups is not important if we focus directly on teams of software engineers and try to identify the relationship between stakeholder management in agile methodology and project outcome and whether the latter makes a significant difference to this relationship.

2. AGILE STAKEHOLDERS

They are persons or organizations who have a vested interest in the IT project and provide their share of funds to complete the project. They will use all or part of the system products generating requirements and user cases. They form a team with users and customers to monitor the success of the projects, from beginning to end. Stakeholders participate in all the phases of system development and provide input for success of the project and reuse the system products cost effectively. A formal definition of a stakeholder is: “Individuals and organizations who are actively involved in the project, or whose interests may be positively or negatively affected as a result of project execution or successful project completion”. [Freeman 1984]

Fig 2: Stakeholder priority in Software SME’s

The success of a project depends on involving the right people for the job. Therefore, a significant stakeholder is any person whose interests must be accommodated in order for the project to succeed (Hannay, et al 2007). Involving the right people is critical. The set of Success-Critical stakeholders therefore typically changes throughout a project. Project stakeholders usually include the Project Manager, the Systems Engineer, the Customer, project team members and the Project Owner. Not meeting the needs and expectations of one Success-Critical Stakeholder may jeopardize the project. The main stakeholders in the SME where agile methodology was used are the Team lead who is also known as Scrum Master/ Team Coach. They are responsible for taking care of the team as a whole, getting resources for the team and also providing protection for the team from problems that may crop up in the middle. The other stakeholders are team members and the product owners and /or anyone who happens to be a user whether directly/ indirectly and the others involved in the project.

Stakeholder Management in Agile projects

Management in project management has a predetermined and well organized character. Compared to other projects IT projects are different since the deliverables are not tangible and the ever changing nature of the
software industry. Stakeholders play a greater role in agile methods than like the traditional methods. It is more open, flexible and the focus is more on people than the methods. A stakeholder analysis shall be done in order to identify the most significant and important stakeholders, (Boehm and Jain, 2006). By performing this, it will be easier to identify and understand the attitude and expectations of major stakeholders inside and outside the project environment.

The objective is to understand the current state of small companies who carry out projects using agile methods and stakeholder management. It has been seen and noted that there is an increasing interest in tackling the area of stakeholder management and small/medium enterprises on the part of the Software Engineering community. This is indicated by the appearance of a great number of research work in progress as well as proposals related to stakeholder management in small and medium enterprises, according an analysis of publications that were carried out. (Johnson DL, et.al 1999). Several of the studies reported on come within the framework of strategies encouraged by governmental organizations.

For stakeholder management to be successful in agile projects, commitment of the company is necessary (Dyba, 2005), the latter should value the future competitive advantages than the present hurdles they may undergo. An analysis was conducted after literature review where the relevant findings of the study was then compared with the review. The findings are based on the discussion of important aspects related to this area of knowledge and include all aspects such as size of the companies involved, stakeholder identification models used, improvement proposals for stakeholder management, and factors in success employed in this research study. Literature review is a key technique for secondary data collection, whereas observation, interview, questionnaire and critical literature analysis are used for primary data collection. Theoretically, this section aims at identifying main characteristics of stakeholder management in the project. It is important to understand weather stakeholder management itself is being organized in agile way or it rather follows traditional approaches. This is needed in order to reveal if there is any influence of the chosen agile system development approach on the project’s stakeholder management.

3. CASE STUDY

The principal aim of this study was to investigate the topic of stakeholder identification and management in small scale enterprises where agile methodology is used. By doing this, new research activities can be identified to further project success in these types of companies. A research question has also been formulated that aims to get an idea into the current state of practice of stakeholder management efforts in small/medium enterprise using agile methods in industry. To understand the stakeholder management practice in medium scale software organization’s using agile methodology, the current project can be classified as a qualitative research due to its focus on qualitative data collection through interviews, observations and literature review. (Richardson, 2001) While gathering necessary information for further drawing conclusions or making suggestions for improvements the focus is to be made on analytical procedures and explanatory approach to existing municipal practices by means of qualitative research methods. Though since the 1960s software has been developed, none knows the clear demarcating stakeholder factors that ensure project success. The same can be said for projects and companies using the agile methodology too (ISO, 2006). Such small scale agile development projects are affected by a series of problems, such as organizational immaturity, lack of involvement of top management, poor project management techniques including stakeholder management, budget shortages, changes in requirements and scope due to erratic stakeholder interaction, poor quality software and under-motivated developers. Over the years experienced project managers, organizations and researchers have attempted to trap the essence of what is behind project success in similar kind of projects (Saiedian, H., & Carr, N. 1997). Although there is not much literature on this topic, few studies have examined how in such small scale software enterprises that use Agile methods, how the project success is defined in practice, and the implications of defining and measuring success on project outcomes (Eman & N. Madhavji, 2010). Many studies have shown that project success and failure in such firms is a question of perception and that the criteria could vary from project to project (Hannay et al, 2007). The same project can be defined as successful or as a failure from the point of view of different groups of stakeholders (Richardson, I. 2001).

Some researchers feel that stakeholders could regard a project that was in fact successful in achieving near optimal results as a partial failure (Kitchenham B. 2004). On the other hand, sponsors of a project may view success as project survival, in which case even if the project did not perform in an optimum manner, it may be regarded as project success. Baccarini stated that project success criteria is the incorporation of project management as well as product successes. It was also noted that project management success covers meeting the triple constraint objectives, while product success deals with the ability of the project's final product to meet the project owner's
strategic organizational objectives; satisfaction of users and other stakeholders’ needs where they relate to the product (L.W.Smith, 2000). Based on the literature survey of software stakeholder management during the period of 1991 to 2015 as well as practitioner’s guides (PMI, 2013) and (CMMI, 2010) a survey questionnaire was developed to assess the stakeholder factors, stakeholder management factors and project constraints. The questionnaire was subjected to three rounds of review by senior IT professionals & academicians, for content validity. The questionnaire consisted of 127 questions. Twenty-two responses were received from the pilot survey. Based on analysis of the responses (review comments, and no response), the questionnaire was revised. The revisions included addition, change, deletion, regrouping, and merging. Forty-nine questions were deleted. All questions were revised to make them clear and concise. From the study it can be seen that most of the respondents were unwelcoming about giving importance and time for stakeholder analysis and deemed it unnecessary for Agile methods. Stakeholder identification during software requirements elicitation is a simple process where the project lead randomly lists out the people involved. At this stage, the appropriate identification of stakeholders was a key aspect, in the sense that they must be complete, which unfortunately in the project for which the study was conducted, was not done properly. Good interaction though was present during the information gathering process, and also between all stakeholders and the system to avoid conflicts and problems of communication arising from different points of view.

In the case study, the units of analysis were the stakeholder management factors that emerged from the survey-based study. The cases were selected based on the researcher’s network with IT professionals. Projects were chosen such that they exhibited large variation in their characteristics. These were projects executed by different global IT companies with matured quality processes (CMMi Level 5), for different fortune-500 companies, who were in turn global leaders in different business domains – viz., Banking, Financial Services, Healthcare and Manufacturing. Three studies were conducted as shown below:-There are numerous studies on development projects. Among them, study on agile scrum projects are of current interest. Therefore, an embedded case study of a medium project using agile scrum methodology was undertaken to check the proposed model for development projects.

4. CONCLUSION

There is an increasing interest in tackling stakeholders in software SME’s since that play an important role in such a projects success. It can be seen that it is very difficult for small companies using Agile methods to incorporate
stakeholder management methods but efforts are taken to adapt and use various stakeholder identification and analysis methods when improvement efforts are undertaken. But in most of the instances, there is no registry for stakeholders and extensive stakeholder lists were not prepared. This led to trouble later since requirements were not completely understood and led to complications and delay in the course of the project. There was stiff opposition from the employees to spend more time on stakeholder management due to lack of experience and reluctance to utilize time for the same. In this paper, the results show that it is indeed very tedious to successfully apply formal stakeholder management methods in small and medium software firms where agile methodology is the preferred method.

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PERSONAL BRANDING AS AN EFFECTIVE TOOL FOR SELF POSITIONING BY BUSINESS STUDENTS

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ABSTRACT
The study aims at finding the scope of personal branding and its importance among for the business school students’ to maximize their popularity.

The core principle of personal branding is promoting you and seeing yourself as a brand. Personal branding of Corporate Leaders simply mean promoting oneself and seeing oneself as a brand, where the Corporate Leader becomes a brand itself than its organization. Every single thing that a business student does day in & day out can be considered as a part of personal branding which makes him/her stand apart from the rest. It is the USP of the Leaders through different marketing and branding strategies creates an opinion being the most powerful Corporate honchos among corporate fraternity. Personal branding is the process by which individuals and entrepreneurs differentiate themselves and stand out from a crowd by identifying and articulating their unique value proposition, whether professional or personal, and then leverage it across platforms with a consistent message and image to achieve a specific goal (Schawbel, 2010, p. 6). Having a strong Personal Brand is a very important asset in today’s online, virtual, and individual age. Successful Personal Branding entails managing the perceptions effectively and controlling and influencing how others perceive you and thinks of you. It is thus becoming increasingly essential and is the key to personal success.

Key words: Brand enhancement, USP, brand rejuvenation.

1. INTRODUCTION
India presently has around 1900 and more business schools (B-schools) approved by All India Council for Technical Education (AICTE), the apex approving authority, under Ministry of Human Resources, Government of India, as the management education movement is nearing its fifth decade. The first Indian Institute of Management (IIM) was set up at Ahmedabad in 1961. For a long time business schools in India have been classified into the IIMs and the rest. The IIMs have undoubtedly maintained their top rankings but there are a number of B-schools who are narrowing the lead. Though an institute like, IIM-A unquestionably provides a benchmark, there is very little difference between the other B-schools at the top 25 (Sinha 2007).

Enrolment in higher education has increased from about 6.65 million in 1995 to nearly 12 million in 2005. Trend is very similar for management education. The significance of Indian management schools lies more in the context that 68 percent of the Indian population will be in the 22-27 year age group by 2020. This is the biggest ever opportunity for Indian youth when the world will look towards them and their acquired talent in various fields. Moreover, this trend will be further supported by the graying of the population across the US, Europe, China, Canada and Japan, as such there will be a shortage of talent globally.

In a recent IMRB Survey the approved B-schools, 199 participated in the survey. The survey throws up emerging trends like more applicants, curricula changes, greater internationalization, upward movement in salaries, better placement records, improvements in technology and infrastructure. At the same time, the findings bring out, the wide variations which exist amongst the various categories of B-schools.

Looking at the higher education in totality, a total of 17,625 colleges and 317 universities exist in India. However, till march 2007, National Assessment & Accreditation Council (NAAC), an autonomous body set up by government in 1994 to ensure quality, could accredit only 3, 942 colleges and 140 universities in the country.

Their assessment is based on several parameters like qualifications of faculty, availability of books, sports, facilities, and infrastructure and so on. This implies that nearly 75% of colleges and 56% of universities have never been assessed for quality standards by the body set up for the purpose. Among the colleges that have been accredited by NAAC, only 245 colleges are in the A range, 1,785 in the B range and 668 in the C range and these could be graded as high, medium and low quality colleges, which constitute 9%, 66%, and 25% respectively of those that have been graded.

University Grants Commission (UGC) has about 14,000 colleges under its purview, however, in its own estimates, only about 38% fulfill the minimum conditions required for recognition and financial support. In a survey conducted
by UGC, quality standards of 111 universities and 1473 colleges were checked which included parameters like qualification of teachers, student–teacher ratios, number of books available, and a host of basic facilities like hostels, sports, auditorium, common rooms etc. The findings in this case also presents a negative picture–only 8% colleges got an A grade, 37% were adjudged B grade and about 36% were classified as C grade. This is the case when only some minimal quantifiable parameters are being assessed.

According to the Wall Street Journal yearly study, which serves to create their b-school ranking, recruiters’ most highly valued attributes in the selection of MBA graduates are (Wall Street Journal, 2005) communication and interpersonal skills (89%); ability to work well within a team (87%); personal ethics and integrity (85%); analytical and problem-solving skills (84%); success with past hires (74%); leadership potential (73%); fit with the corporate culture (72%); strategic thinking (68%); likelihood of recruiting “stars” (64%); and being well rounded (54%).

Other researchers have arrived at similar conclusions. Kane (1993) asked recruiters to indicate the importance of various criteria for three categories of positions for which MBA students might be hired: general management positions, functional areas, and commissioned sales positions. Strong interpersonal, communication, and team-oriented skills emerged the most important criteria for each category. Rao (2004) in his report on Management Education in India states that development of industry interactions is an evolutionary process. The main strength of top business schools like Kellogg, Harvard, Sloan, Wharton etc. is their strong relationship with industry through teaching, research, student’s placements, problem solving and case study preparations. Beard (1994) has a number of recommendations towards increasing and enhancing academia-industry interface, which include: Greater degree of industry-school collaboration to integrate employer’s needs into:

- the programmes on offer; Real involvement with industry to allow students to gain valuable practical
- experience and also to facilitate development of business; Improve the programmes by encouraging the participation of a number of guests
- speakers who can offer their own practical experiences; Academic staff should be encouraged to keep their skills updated by undertaking practical consultancy on regular basis. Byrne (1991) says that companies demand more relevance today. He adds that MBA programmes provide less relevance with the job, are felt to be too long and insufficiently flexible. To improve the quality of output, more and more business corporations are looking to collaborate in more detail with business schools to create programmes, which can be customized according to company’s individual needs and requirements.

2. METHODOLOGY

The paper is based on a survey of the soft skills and body language of the B-School students in West Bengal. Additionally the relevance of the theoretical skills imparted, to the Industry requirements, the inquisitiveness and openness to learn not only from the B-School subjects, but also from the external environment. A sample of 150 students under different colleges was studied as regards their preferred choice of the Industry and their preparedness for the same. The attitude of the students, their ability to handle stress, sincerity, inculcation of basic human values, flexibility etc. were studied over a period of time and were compared with the requirements of the Industry so as to meet the gap.

The paper seeks to understand, investigate and explore the immense role of getting things right as demanded by the Industry and investigates the different facets of attitude, motivation, perception, body language, interview etiquettes, ability to handle stress and pressure in an aim to try to formulate means for organizing and structuring the same so as to ensure better employability index in the B-School students thus strengthening the Brand Image.

3. FINDINGS AND RECOMMENDATIONS

The second and third tier B-schools are mostly perceived by the students, who are mostly freshers, as no better than placement agencies, according to a recent survey by AT Kearney. The curricula followed are mostly backdated and theoretical and is not customized according to the Industry needs. The students here are ill informed and do not have any preference for specific sectors, being more concerned in getting placed in reputed brands. Here in comes the role of Industry exposure and sessions by the Industry experts and analysts. Industry oriented grooming, based on the right choice of students, with the right mix of Corporate and Academia on board, thus is absolutely essential. Organisations across sectors have myriad requirements, hence the role of counseling is important to understand each and every student’s psyche and his/ her ability to take on a particular role. It was found that most of the students had high aspirations but when came to the deliverables, they faltered miserably. A Commercial Organisation, hiring a fresher has limited choices as related experience is missing, hence a huge sum has to be allotted on training the candidate and understanding the proper fit of the Management Trainee hired, thus the B-Schools should communicate and insist that a Corporate hires them for a long term perspective and sudden attrition based on inflexibility or job related dissonance will unnecessarily create troubles for both the student and the B-School as a supplier.
Shaping the mindset of the students appropriate to the job requires rigorous psychological counseling as an aggressive but methodical candidate will do well in sales which requires convincing and negotiation skills, whereas finance demands more of logical, analytical abilities with proper accounting knowledge. A sales guy would be more of an extrovert whereas an introvert is more suited to Finance, though not necessarily. The role of the Communications Faculty is to prescribe the appropriate range of choices that a candidate can opt for.

It has been found that at a good 68% of the candidates studying in these B-Schools donot do proper research too as regards the prospective sectors. A specific sector like FMCG/CD may be preferred choice but one has to understand that the requirements in these is extremely low and unless a candidate is absolutely perfect in all aspects, the chances are scarce that the candidate will get selected. Further, the y-o-y growth of the sectors, do not remain the same. An extensive research is thus to be done on the prospective Sectors and the Companies which are in expansion mode and approaching the same from the B-School.

Several Consulting firms, especially the Big Four viz. Deloitte, PwC, Capegemini, KPMG require candidates to be hired as analysts who have to be not only adaptable to the flexible timings of the clients in different time zones, but also understand and communicate in the accent of the customer so as to ensure proper rapport building and hence enhanced business solutions services. The candidates, who aspire to cement their position in such Corporates, should be trained on a regular basis to interpret US, UK and Australian accent. In most of the B-School students surveyed, around 60-70% of the students had English as their second language till senior secondary and hence regular classes are required to equip these candidates to get selected in these Companies.

While most of the top rung B-Schools also teaches foreign language as a part of the language program, the emphasis is as low as 5% in the sample surveyed. A foreign language exposure is a definite value addition and opens up vistas for overseas placements. Ironically, around 57% of the students are not willing to even relocate.

As high as 79% of the students surveyed showed lack of interest in participating in B-Plan Competitions, Quiz, debates, extempore, Corporate seminars and so on. They preferred text book oriented teaching as compared to case based analysis. Whereas case study based teaching pulls out the innate knowledge gained and is very much practical in its orientation, a theoretical teaching is monotonous, backdated and lacks applicability.

The Management of these Institutions should work out and formulate ways and means to address the same to the students at large. Besides, exposure to the specialized sectors like Retail, Healthcare, Media, Advertising, Travel and Tourism, logistics, Financial Services etc is the need of the day and a general MBA is redundant as the Industry requires candidates having sector specific knowledge as a resource who can be trained effectively in a lesser time so the delivery can be speedier. As many as 83% of the sample surveyed went for a general curriculum and very scarce attention was given to specialized course design by the Institution as a value addition.

A lot of tact, grit and determination is also required in selecting the right candidate for the right Organisation and it is the role of the placement team in line with the Company to enable find the right match for the same. the scenario can be changed positively through such means as:

1. Run B-School like a business, i.e., adopt all models in day to day functioning like adoption of best-in-practices in such cases as inventory control governance, communication network, etc. Most of the B Schools are run not on Management principles nor do they exploit fully technology in all their affairs.
2. Faculty and staff need to have quest for excellence. This can be achieved through such means as association with professional bodies, industry, government and community.
3. At least 40% course is designed by individual faculty as per the present/future trend of market.
4. Faculty is trained for teaching skills; get involved in research, consultancy and industry association. In fact faculty needs to generate at least 40% revenue through their entrepreneurship and innovative approach.
5. At least 30% faculty needs to be from the industry.
6. We need to evolve dynamic teaching-learning methods, reduce credits for courses, stress on interaction and flipped classrooms, extensive use of mobile technology, social media, e-Learning, etc.
8. Adopt Outcome Based Education with sincere/market driven POs and PEOs.
9. The program is so designed that the requisite market skills are implanted as a natural course during the program span.
10. Concluding, with the recommendation the HR Head of one of India’s largest cement manufacturers, a proper categorization of the students and gradation of the ability as per the options is the prescription for the
Communications and the Placement Team and that done effectively, will enhance the employability potential which stands as a meager 30% with the semi-employable figures at 25-30% and the rest at unemployable levels.

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NEW SERVICE DEVELOPMENTS FOR NON-CLINICAL DEPRESSION IN THE WORKPLACE

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ABSTRACT

Non-clinical depression is not an official medical category, but its estimated impact on workplace productivity in Japan is substantial. Few risk management methods or studies have focused on reducing the effect of this type of depression on workplace productivity. Human error, staff turnover, motivation, engagement, and deterioration of wellbeing among employees are all influenced by the incidence of non-clinical depression in the workplace.

This paper introduces a new approach to cope with the risk of non-clinical depression in the workplace. The main research concept is to verify the use of research from six selected industry groups: the fitness, information technology (IT), health food, tourism, spa, and education industries. There has been no previous systematic study examining the use of industry-related services for non-clinical depression in place of conventional medical tools and therapies. I propose that there is good evidence that services related to the fitness industry and IT industries could be effective for non-clinical depression. The health food industry shows some potential in treating depression if the risk of oversell of products can be controlled. However, there is no current evidence that tourism and spa industry services are effective. Education industry services show high potential if new teaching materials and tools are adopted in the future, together with more advanced IT. This paper concludes that new risk management methodology can be used to assist employees with non-clinical depression symptoms; thus, corporate management can carry out risk management and use services from the fitness industry and IT industries. The Employer Assistance Program (EAP), which has a long history of interventions for workers suffering from depression, should also incorporate this concept into existing services, such as employee counseling. This is a new concept of workplace risk management and more statistical and scientific evidence is needed in the form of follow-up studies of real cases in the workplace.

Keywords: industrial entrepreneurship, non-clinical depression, human resources management, risk management, innovation.

NEW SERVICE DEVELOPMENTS FOR NON-CLINICAL DEPRESSION IN THE WORKPLACE

The risk of depression in the workplace is a problem of the highest priority for organizations in developed countries and is a key concern of management. In recent years, epidemiological studies in Europe and America have indicated that this problem should be targeted for workplace interventions, such as risk management, particularly because individuals with mild depression experience an increased risk of more severe depression in the future (Cuijpers, de Graaf, & van Dorsselaer, 2004a; Kessler, Zhao, Blazer, & Swartz, 1997).

However, the way that organizations handle the problem of depression is still something of a “black box.” Development of a risk management strategy for depression requires innovation on the part of businesses. Unfortunately, there has been little progress toward this goal in most workplaces worldwide. This paper discusses risk management policies and actions to address non-clinical depression in the workplace from a totally new perspective.

According to a report by the Japanese Ministry of Health, Labour and Welfare, (Hongo & Nakaya, Report on suicide and financial impact of depression 2010.9.7) 26,539 people aged 15–69 years committed suicide in 2009, with a total loss of future life income of 1.9 trillion yen. Furthermore, just over 300 billion yen was spent on medical expenses and nearly 300 billion yen on welfare allowance for depression in 2009. The amount of income loss as a result of temporary absence from work because of depression was just over 100 billion yen. In total, the economic loss caused by depression and suicide in Japan in just 2009 was about 2.7 trillion yen. Aside from this loss, gross domestic product in 2010 fell by 1,700 billion yen, a decrease that is expected to continue.

Economic calculations have also predicted a loss in tax yield because of the impact of depression but there is no current evaluation of risk management strategies to address the impact of depression on the productivity of companies or the public body.

According to Shima and others, 470,000 people in Japan are absent from work more than once a month because of mental illness, with a loss to profits rising to 950 billion yen (Shima, 2002). One mental health research institute examined social economic productivity using a questionnaire survey in 2006. All listed companies in Japan were surveyed and the percentage of companies with staff absent from work for more than one month increased by 59% a year in 2002, 67% in 2004, and 75% in 2006 (Social Economic Productivity Headquaters, 2006).
In Japan, Employee Assistance Programs (EAPs) have been widely used to identify and help to address depression in the workplace; these programs are considered effective to a certain extent, but there is little evidence for the effectiveness of risk management in addressing non-clinical depression. The number of people in China with mental illness is estimated to be more than 100 million (Zhang & Watanabe, 2014); of these, 55 million suffer from depression and 16 million from mental breakdown (Zhang & Watanabe, 2014).

These problems are exacerbated by a lack of knowledge about mental illness, the lack of doctors and counselors in urban areas, and other problems such as residents to doctor ratio differences in rural regions (Zhang & Watanabe, 2014). For example, there was a series of 13 suicides or attempted suicides at Foxconn Technology Group in 2010. The senior managers in this company assumed responsibility for this and were forced to resign (Zhang & Watanabe, 2014).

In the United Kingdom, mental illness (including depression and nervous disorders) results in an economic loss of 26,100 million pounds a year (approximately 4 trillion yen) (UK Ministry of Health, 2007). One analysis estimated this as 22,500 million pounds (approximately a little over 3 trillion yen), a loss of labor costing 48,600 million pounds a year (approximately 7,800 billion yen), the total cost of which has a large impact on the national economy; the predicted loss in 2026 was estimated at 88,400 million pounds (approximately 14 trillion yen) (Aslam et al., 2011).

According to an analysis of the Japanese economy taking into account population and GDP (the population of England is approximately 50 million, approximately 40% of the population of Japan; GDP in England is approximately 2,200 billion dollars, approximately 50% of the GDP in Japan), economic loss due to mental illness is approximately 15,200 billion yen. According to Nishida and other researchers from Tokyo Institute of Psychiatry, the loss is estimated to reach nearly 30 trillion yen in 2026 (Nishida, 2009). In the United Kingdom, there is evidence that computerized cognitive-behavioral therapy (CCBT) is moderately effective for anxiety and depression, but this approach needs to be incorporated into risk management structures. Economic loss caused by depression in the United States has led to a 53% decline in productivity, but up for 28% of medical expenses, and a 17% up for incidence of suicide (Hall & Wise, 1995).

These examples illustrate a management blind spot that suggests failure of the risk management process. Depression is a severe mental illness that impacts many aspects of life. In this paper, the term “depression” is used to refer to the clinical diagnosis of major depression. This is a more serious illness that is more likely to result in economic loss compared with “non-clinical depression,” which is a normal reaction to difficult life events, but which can lead to a long-term depressive state.

The term “non-clinical” is not an official medical term, but non-clinical depression is used in this paper to describe a state where a person feels neither ill nor healthy. Psychiatrists agree that major depression is related to a high suicide risk and that active and comprehensive medical interventions are needed for this condition. In contrast, it is only when a period of mild depression results in chronic depression that it is categorized as major depression. Many individuals experience mild depression; if untreated, mild depression can be difficult to recover from and may lead to a decline in productivity.

There are different perspectives on depression, but psychiatrists often assume that severe depression and mild depression are heterogeneous. Although non-clinical depression is often termed “depression”; major depression-related disorders (“major depression”) are characterized by reliable diagnostic criteria, such as those in the Diagnostic and Statistical Manual and the International Classification of Diseases published by the World Health Organization (WHO).

Major depression is usually medically diagnosed as a mental illness, and involves severe symptoms that make it difficult to lead a normal life. However, there is a psychiatrically recognized condition of depressed mental state (non-clinical depression) that involves symptoms that do not meet the diagnostic criteria for depression. There are several terms for this condition (Morgan & Jorm, 2008), but it is generally characterized by mild depression. Although this is not classed as a serious disorder, it is characterized by mild mental and physical problems and often caused by stress. This milder condition of non-clinical or temporary depression is situated on the border between “normal” functioning and depression.

Mild depression is difficult to treat medically and does not always respond to medication. However, effective risk management of non-clinical depression is something of a “black box.” As efforts to manage this disorder in the past have not been clearly described, the following summary outlines relevant approaches.

According to recent research on the decline in productivity resulting from mild depression, presenteesim (in which a person attends work while ill and is less productive) leads to a greater decline in productivity than absenteeism and lateness (Stewart, Ricci, Chee, & Hahn, 2003). In the United States, 81% of the decline in productivity in the workplace is because of presenteesim; research (e.g., Stewart et al., 2003) indicates that depression is the main reason for this decline and that 48% of symptoms related to productivity loss are caused by major depression.
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From a different perspective, 50% or more of cases of presenteeism caused by depression comprise mild depression (or depressed mental state) that may involve serious symptoms but are not classed as major depression. Therefore, mild depression in the workplace is a greater risk factor for productivity decline than major depression. In other words, mild depression affects productivity as much as severe depression.

Research by Stewart and others suggests that half of employees with mild depression can be classed as experiencing non-clinical depression, and they found that most of the 114 employees engaging in presenteeism were misdiagnosed with non-clinical depression.

Epidemiological studies indicate that although individuals with mild depression may not experience severe symptoms, the disorder places a large burden on society. Judd, Schettler, and Akiskal (2002) and others have pointed out that this is because most people with depression are diagnosed with non-clinical depression. The need for risk management of mild depression has led to new, comprehensive models of depression in Japan and China that address mental health in the workplace (Zhang & Watanabe, 2014). Early detection of mild depression is needed, and as with physical illness, early treatment of mental illness is desirable.

Risk management strategies in the workplace may benefit from preventive medical approaches, which rely on early detection of mild depression before it becomes more serious. Early detection is also important because even mild depression can impair productivity and social relationships; in addition, if mild depression becomes more severe, treatment is more difficult. However, care is needed when choosing the most appropriate treatment for mild depression. From a medical economic point of view, the objective of treating major depression is to utilize resources effectively. However, as the incidence of mild depression is so great, the health resources to treat this disorder are limited.

The number of patients receiving medical treatment for mental illness in Japan increased rapidly by 1.6 times in only six years (1999–2005) (Ministry of Health, Labour and Welfare, 2005). According to a Ministry of Health, Labour and Welfare policy report in Japan, the number of patients with mood disorders such as depression was 433,000 in 1996; by 2008, this figure increased 2.4 times to 1,041,000.

In Europe and America, employee welfare programs have a long history. In Japan, treatment of mental health in the workplace is led by the big organizations. The case of the company Dentsu, who admitted liability for the suicide of one worker as a result of overwork, has led to a risk aversion tendency on the part of management personnel, who increasingly require employees to produce medical certificates for depression and recommend a leave of absence for this problem. This has contributed to an increase in depression diagnoses. However, epidemiological data indicate that the number of people medically diagnosed with depression represent the tip of the iceberg. For example, according to an international collaborative investigation by the WHO, only 19% of people who consulted physicians in internal medicine outpatient departments of general hospitals were diagnosed with depression. In the United States, 20.1% of people experiencing mental illness receive some kind of medical care from the internal medicine outpatient department of general hospitals (Kessler et al., 2005).

The percentage of people diagnosed with depression after being tested at a medical institution in Japan is low compared with figures from the Organization for Economic Co-operation and Development countries; however, epidemiological data from Japan indicate that 18.6% of people have a medical diagnosis of depression (Kawakami, Tsuchiya, Tachimori, & Takeshima, 2005).

Guidelines by the National Institute for Health and Care Excellence (NICE) indicate that the disadvantages of medical treatment for mild depression probably outweigh the benefits (Fournier et al., 2010; Kirsch et al., 2008; NICE, 2011). A systematic review by Marchesi, De Panfilis, Tonna, and Ossola (2013) questions whether treatment for mild depression produces more than just a placebo effect. Worldwide guidelines for treatment of severe depression specify a consultation time of approximately 15 min. Treatment of major depression in Japan within the standard medical framework appears possible (Ministry of Health, Labour and Welfare, 2007).

In Japan, the psychiatry outpatient department consultation duration is an average of 10 min. However, it is not clear whether psychiatric treatment of mild depression is sufficiently effective. Non-pharmacological psychotherapy-based interventions, mainly cognitive-behavioral therapy (CBT), are just as effective for mild depression. In the United Kingdom, NICE has recommended a combination of medical treatment and synergistic or alternative therapies (NICE, 2011). Therapy for mild depression in Japan has been limited to physician-based medical treatments, although the health insurance system accepted CBT interventions in 2010. However, although these therapies are available and of good quality, there are limited numbers of therapists. General psychiatric training in Japan does not incorporate therapies other than standard medical treatments. In addition, problems with quality control and supply need to be urgently addressed. Unlike in Europe and America, there is no national qualification for psychologists in Japan.

Recently, there has been progress in implementing such a qualification. However, it may take time to create consistent standards in CBT across the whole country. In addition, even if consistent standards for this type of therapy are applied in the near future in Japan, non-clinical depression does not receive the same kind of recognition as major depression, and such alternative therapies may not be supported by health insurance.
In the United Kingdom, the Improved Access to Psychological Therapies program, which offers people experiencing anxiety and depression access to psychological therapies, has resulted in 10,000 more people being treated with CBT compared with other countries since 2006. And by 2012, approximately 4,000 new cognitive-behavioral therapist positions had been created as a result of this program. Nevertheless, the waiting time in the United Kingdom for psychotherapy following a diagnosis of depression and referral by a family doctor (a general medical practitioner) is an average of 6 months. In Japan, even if there is an increase in cognitive-behavioral therapists, more health resources are allocated to treat major depression, compared with non-clinical depression. In other words, priority is given to treatment of more serious cases because chronic depression can lead to many psychosocial problems (Andrews, Sanderson, Slade, & Issakidis, 2000).

In China, the Mental Health Act was enforced in May 2013. In this Act, the prevention of mental illness is described in terms of the promotion of mental health; the Act prohibits discrimination against people with mental illness, and prohibits forced hospitalization (Zhang & Watanabe, 2014). In China, there are 1.46 psychiatrists per 100,000 people and 20,000 registered doctors of psychiatry, a quarter of the global average. Medical care resources for mental health are currently very limited in China. Only 5,000 psychiatrists are licensed, and of these, around 3,000 psychiatrists are permitted to prescribe antidepressant medications developed in Europe and America and based on Western medical treatment (Zhang & Watanabe, 2014). Most of these psychiatrists are concentrated in the big Chinese coastal cities (for example, there is 1 psychiatrist per 1,000 people in Beijing). However, there are relatively few psychiatric resources, and no statistics for mental health care in rural areas (People Network, 2011).

There is uncertainty about the future treatment of individuals with mental illness in China. Few medical students are inclined to study psychiatry because the income for psychiatrists is lower than for physicians, leading to a prejudice against psychiatry and clinical practice. The evidence-based approach is not limited to medical practice, but has been applied to risk management in the workplace. Specifically, it can inform innovative, flexible, private enterprise-based services for non-clinical depression in the workplace without increasing the burden on the public medical system.

New risk-management approaches can directly improve the assessment of risk in the workplace caused by non-clinical depression and provide reliable interventions. As individuals who have recovered from depression may experience reoccurrence of symptoms, such approaches could help to address this problem and thus mitigate adverse effects to productivity and reduce the burden of medical expenses. From a national perspective, a new approach to health care in the workplace would benefit industry. For example, there is a large service industry in Japan (including the fitness and IT [information technology] industries) that could provide health care services for depression.

The development of the service industry should occur in conjunction with risk management measures for mental health that provide basic health care services. It may be necessary to introduce innovative risk management strategies in management business schools that address mental health issues in the workplace for healthy people. The industrial sector in Japan has anticipated this type of innovation; however, it has not yet been provided by medical doctors and psychological counselors. In Japan and China, people with mild or non-clinical depression are not as likely to receive active interventions from the national health system, which creates a substantial risk of this problem affecting the workplace. This paper proposes that innovative approaches to risk management that draw upon task-shift models offer support for non-clinical depression characterized by mild symptoms that may escape detection.

The approach advocated here is justified by the following points. Primarily, it is desirable that interventions for depression are based on research evidence. Second, assuming that they are based on sound research evidence, mild interventions for non-clinical depression may be economically beneficial by reducing medical expenses and increasing productivity. Third, the approach adopted in the UK health model of mild interventions for non-clinical depression should be built into the Japanese model. Fourth, prompt interventions for non-clinical depression will be facilitated because this model draws on best practice from private health care systems where they have already been implemented.

Because non-clinical depression often does not meet diagnostic criteria, healthy individuals may not be diagnosed as unwell; effective risk management strategies may be able to identify such individuals and assist them with mild interventions. The rationale underlying private enterprise-led health care incorporates mild interventions as part of the risk management for non-clinical depression, as well as task shifting and graded care for employees. In addition, counseling and EAPs can be effective; however, private companies often avoid marketing services for non-clinical depression.

It is yet to be seen whether health care services provided by these industries have adequate effects on depression. Future randomized controlled trials (RCTs) and meta-analyses will be needed. In an RCT, subjects are randomly allocated to treatment groups to test the effect of an intervention against a control or placebo; this is the most objective way to examine the effects of an intervention and determine possible causality. Meta-analysis is a method of statistically synthesizing RCT study results to examine patterns across different studies; it can provide a more powerful way of analyzing intervention effects and is considered a reliable research tool. Meta-analytic
results can help to compare current findings from different countries and identify gaps in research and future trends.

Risk management measures that involve mild interventions for non-clinical depression in private companies and industry must be subject to the same requirements of evidence as medical research before findings can be generalized nationwide. The following industries should conform to these requirements:

1. Fitness (it is relatively easy to develop effective mild interventions for non-clinical depression in private companies);
2. Health food;
3. IT;
4. Tourism;
5. Six related sectors of the spa service industry; and
6. Education.

**FITNESS INDUSTRY**

The beneficial effects of exercise on physical health are already well known and there is evidence that exercise improves mental health. A Cochrane review in 2010 (“Exercise for Depression”) used a meta-analysis of 28 studies to assess the effects of exercise on depression. When the no treatment or control groups were compared with the exercise group, the pooled standardized mean difference was −0.67, 95% CI [−0.90, −0.43], indicating a moderate clinical effect. There was also a long-term effect of exercise: standardized mean difference, −0.39, 95% CI [−0.69, −0.09] and this effect was maintained even when the amount of exercise decreased. However, the review suggested that some level of exercise had to be maintained for its beneficial effect to persist (Rimer et al., 2012). The effect of exercise on depression was found to be equal to that of antidepressants and CBT, which are standard treatments for depression.

A more recent update to this Cochrane review on exercise and depression was published by Cooney et al. (2013). This review examined 35 RCTs and the findings were similar to those of the previous review. Sensitivity analysis was used to examine whether study quality influenced the outcome. Only six trials used adequate allocation concealment, intention-to-treat analysis, and blinded outcome assessment; when the analysis was restricted to these trials, no significant effect was found for exercise.

However, as Cooney et al. (2013) state, studies that included participants with emotional distress rather than depression, and those that included healthy people, were excluded. The diagnosis of mild depression, and the distinction between that disorder and other degrees of emotional distress, can be difficult. It is clear that more research is needed before conclusions can be drawn about the potential benefits of exercise for depression.

Most studies reviewed in this meta-analysis featured aerobic exercise, including running, walking (a treadmill or real walking), dance, and cycling. The findings indicated a potentially stronger effect for a combination of exercise (e.g., resistance training and aerobic exercise) than for a single type of exercise (similar to the way in which combined treatment with both antidepressants and other therapies may be more effective than either therapy alone). It is likely that participants’ preference for certain types of exercise, and their enjoyment of the exercise, influenced adherence to exercise regimes. Among the studies reviewed, there was substantial variation in the frequency, duration, and intensity of exercise interventions, which ranged from 20–45-min sessions, from two to four times per week, and with an intensity range of 70–85% of the maximum heart rate.

Although there are many studies indicating that aerobic exercise affects depression, Statthopoulos, Powers, Berry, Smits, and Otto (2006) and other researchers suggest that both aerobic and anaerobic exercises have beneficial effects. This potential range of beneficial types of exercise increases choice and may make it more likely that people with depression may adopt exercise as a possible intervention. In fact, there have been studies using RCTs to examine the effects of a variety of exercise interventions on depression, including yoga, t'aijiquan and qigong (traditional Chinese martial arts involving self-cultivation techniques), and autogenic training. Pilkington, Kirkwood, Rampes, and Richardson (2005) reviewed five RCTs to analyze the effects of yoga-based interventions (which are very popular in Japan) on depression. They concluded that there was an overall beneficial effect for yoga on depression.

Jin (1992) and Brown et al. (1995) reported positive results from two RCTs investigating the effects of t'aijiquan on non-clinical depression (there are no RCTs examining effects of t'aijiquan on major depression). There is currently not enough research on possible effects of qigong on depression. Farne and Gnugnoli (2000) have shown that autogenic training, particularly practiced over a period of time, can ameliorate non-clinical depression.

These interventions may only be effective if they are administered through adequate training programs by qualified instructors. Combined programs of stress management and relaxation training are now available in some public gyms (e.g., the Japanese sports company Renaissance Inc.). However, in Japan, full-scale intervention services that offer graded medical interventions for non-clinical depression have not kept up with
demand. Family doctors in the United Kingdom may recommend exercise programs to people with mild to moderate depression. One primary health care trust in the United Kingdom has partnered with a private gym (Aqua Terra) to offer a specialized program for depression involving six exercise sessions per week. Aerobic exercise seems to be one of the best mild interventions for depression, and research evidence indicates its effectiveness.

The market size of the fitness industry in Japan in 2012 was just under 300 billion yen in revenue. There is likely to be more differentiation of the services offered and it is important that fitness programs to address depression are tailored to non-clinical depression. The development of fitness interventions is likely to continue in Japan because evidence of the effectiveness of such programs is similar to positive findings in the United Kingdom.

HEALTH FOOD INDUSTRY

In recent years, there has been an increase in evidence for a beneficial effect of supplements on depression. Some standard medical treatments incorporate aspects of healthy living and diet. For example, the Texas Medication Algorithm Project, which provides mental health treatment guidelines for physicians in the Texas public health system, includes recommendations for healthy lifestyle. Individuals diagnosed with mild depression are offered lifestyle interventions, such as help with diet or exercise, before they are given medication.

There is evidence that several different supplements are effective in treating depression. A small amount of research suggests that the intake of omega-3 fatty acids can reduce depression. Suehs et al. (2008) have suggested that depression may be related to a deficiency of folate (low levels of folate have also been linked to birth defects). A meta-analytic study examining the effects of S-adenosylmethionine and St. John’s wort (Hypericum perforatum L.) on depression concluded that these supplements may benefit depression. In addition, one systematic review indicated that S-adenosylmethionine improves major depression in adults (Williams, Girard, Jui, Sabina, & Katz, 2005).

St. John’s wort is particularly well known in Germany, where it is routinely prescribed for depression. A Cochrane review on the use of this herb for depression concluded that St John’s wort is as effective as pharmaceutical antidepressants, and more effective than a placebo, for mild to moderate depression. St John’s wort was found to have fewer side effects than antidepressants; however, the review pointed out that its beneficial effect on depression is weaker in studies from non-German-speaking countries (Linde, Berner, & Kriston, 2008).

There is evidence that a number of other herbal supplements can benefit depression. One RCT showed that a daily supplement of saffron (Crocus sativus L.) was as effective as a placebo for mild to moderate depression (Moshiri et al., 2006); another RCT indicated that saffron supplements were as effective as antidepressants for depression (Noorbala, Akhondzadeh, Tahmacebi-Pour, & Jamshidi, 2005). Sayyah, Sayyah, and Kamalinejad (2006) compared the effectiveness of the herb borage (Echium amoenum) with a placebo and found that borage produced a significant short-term reduction in depression. Akhondzadeh et al. (2003) conducted an RCT and found that participants receiving a combination of an antidepressant and tincture of lavender (Lavandula augustifolia Mill.) experienced a greater reduction in depression than participants who received only the lavender tincture, or only the antidepressant.

Vitamin B6 supplements may also be beneficial for depression. A systematic review by Wyatt, Dimmock, Jones, and Shaughn O’Brien (1999) showed that daily supplements of vitamin B6 may help to reduce premenstrual symptoms and premenstrual depression.

At the 2013 Regulatory Reform Council meeting in Japan, a policy was put in place to legally label a general health food as “a food for specified health use that has a nourishing function”. The health food market is relatively new in Japan but its expansion is anticipated. As many people believe that some supplements have doubtful ingredients, there is a great call for complete disclosure and listing of ingredients. As a health supplement is often a concentrated form of a specific ingredient, there is always a risk of adverse effects; therefore, quality control of such products and severe penalties for suppliers that do not comply with standards are required.

IT INDUSTRY

Sayings such as “My life was saved by a good book” and “Read a book, a heart is healed” express the belief that reading improves mental health and helps people to recover from life crises. In a similar way, self-help books and websites can help people to cope with depression and talk about their problems. Numerous studies indicate that self-help methods based on CBT are effective for depression (Cuijpers, 1997).

Recent work at Tsukuba University in Japan supports the positive effects of bibliotherapy (an expressive therapy that uses books to reduce distress and improve mental health). Progress in IT has facilitated the development of CCBT; several meta-analyses have found that this method is beneficial for depression (So et al., 2013). There is also evidence that CCBT can treat other disorders such as interpersonal fear and social anxiety, obsessive-compulsive disorder, post-traumatic stress, panic disorder, bulimia, and insomnia, and is not limited to treating mental illnesses.
The NICE guidelines recommend CCBT as a first-line treatment for mild depression. In the United Kingdom, CCBT treatment is prescribed by National Health Service family doctors and the applicant can follow the program by themselves or with the support of a therapist. More than 20 self-help CCBT programs for depression have been developed worldwide, and many computer self-study therapy services for depression are provided in Japan by private enterprises. At a presentation for the meeting of the Japanese Mind and Body Medical Education society, this writer revealed the first results in Japan showing a positive effect on employee mood after participation in an Internet-based CCBT program in 2005. This could also be the first program in the world, and a combined CCBT and high-quality Social Networking Service program has been developed by this writer in Japan and named the “Mental Toughness Diary.”

This writer is the author of three books: two print books in Japan and China (Watanabe 2007a; Watanabe, 2013) and a digital e-book distributed by the Apple Inc. iTunes store in 2012. The book was translated and published in China and received many positive Internet reviews.

Other computerized self-help systems have been developed to meet the demand for depression treatment and have had positive effects. For example, Merry et al. (2012) developed a CCBT intervention in the form of a role-playing fantasy game. Participants were adolescents with depressive symptoms. The findings indicated that the CCBT program had positive effects on depression. Self-help materials have also been used to treat post-traumatic stress disorder in US war veterans. For example, McLay et al. (2011) used virtual reality techniques (to simulate combat situations) as exposure therapy to treat post-traumatic stress in active duty military personnel.

A meta-analysis by Parsons and Rizzo (2008) examined the effectiveness of virtual reality-based exposure therapy on anxiety disorders and suggested that the technique could be effective in treating anxiety. Computerized interventions are very effective to access individuals with this problem, as many of these youths spend substantial amounts of time using the Internet. It is hoped that computerized interventions may be an effective solution to this problem. However, a study of Japanese doctors of medicine (So et al., 2013) indicates that the dropout rate for CCBT programs is high. Improvements in the application of these programs, such as their multimedia aspects, may solve this problem.

Meta-analytic studies suggest that interactive (Palmqvist, Carlbring, & Anderson, 2007) and social network-related (Wantland, Portillo, Holzemer, & Slaughter, 2004) CCBT programs are effective in treating depression. CCBT programs that use animations and videos are most effective (Gerhards et al., 2011), as are programs that feature role-playing games (e.g., Merry et al., 2012).

In the United States, virtual reality-based CCBT has been used as an intervention for post-traumatic stress disorder in war veterans who may have experienced injury or been involved in terrorism situations (McLay et al., 2011). The introduction of personal risk profiles and programs tailored to individual needs will also help to increase the effectiveness of CCBT (Perez-Diaz de Cerio, Valenzuela, Ruiz, Garcia-Lozano, & Colome, 2011). In addition, improvements in the use of CCBT applications on portable devices, such as smart phones (e.g., the iPhone) are indispensable (Wodarski & Frimpong, 2013). It is hoped that an innovative IT company in Japan will promote the use of such applications using an innovative business model.

TOURISM INDUSTRY

In June 2013, Prime Minister Abe Shinzo announced a growth strategy for Japan that prioritized “a society of good health and longevity” that can create growth industries. Medical tourism is a new tourism sector that has been increasingly promoted; it combines “sightseeing with medical care.” The new growth strategy that the Kan Administration adopted at a Cabinet meeting in 2010 set forth a policy of medical tourism as an innovative strategy for “a health-promoting, world-leading country.”

In a Cabinet meeting in 2013, the Japanese government approved a basic plan to promote the field of health tourism, with a potential market of 4,130 billion yen, comprising 1,100 billion yen from day trips and 3,030 billion yen from trips with accommodation. This share is 25% of potential tourism market sales, according to a 2007 investigation by the Japan Travel Bureau Health Tourism Institute. The scope of the tourism industry includes travel agencies, accommodation, transport, the souvenir business, and the restaurant business, which have socioeconomic effects on residents, agriculture, forestry, fishery, medical treatment, and the beauty treatment salon business (Japan Tourist Association, 20010).

The concept of mental health tourism was proposed by Koguchi of Rikkyo University in 2008 in an Asian Pacific Sightseeing Society meeting and has gradually spread to other countries (Koguchi, 2008). Traditional health tourism, which includes mental health care, is popular in Europe. For example, spa and health resort therapy (“Kur” or cure in German) is particularly popular in Germany and is often prescribed by doctors. There are now more than 350 kuorts (health resorts and spa towns) in Germany offering various natural Kneipp therapies, including traditional water therapy.

If prescribed by doctors, at least part of these treatments and the hotel charges are covered by public health insurance. These treatments are cost-effective (Maretki, 1987) and contribute to the local industries; they also attract tourists from other countries.
In recent years, there has been co-operation between national government, travel agencies, and local government in Japan to develop health tourism attractions across the country. However, this development is still experimental; these projects need more administrative expertise and more skilled employees. Health tourism can help boost industries such as tourism and travel agencies, local medical services, agriculture, forestry, and fishing and can activate regional economies. Local governments often use health tourism to promote local areas. However, innovative and aggressive public marketing is necessary, along with accumulated knowledge of customer needs, because this market is not very stable. Private companies need to attract customers with sustainable, progressive business models that include the tourism industry.

For example, a health tourism institution providing forest therapy has been created in the district of Yamanashi prefecture. The writer visited this place in 2014 for research purposes. At this site, Ms. Ono, a licensed forest therapist, explained that forest counseling is a form of medical tourism. She told me that the Chinese government has twice sent officials there to observe such forest therapy tourism. One institution that is part of the CSR Company in Kyushu provides health tourism and has provided an example to observers from other countries of how this particular approach can be productive.

It is important that such services comply with legal requirements for safety and are able to demonstrate a medical effect on mental health; this is a concern within the health tourism field (Japan Tourist Association, 2010). A range of therapies are provided in health tourism settings, including kinesitherapy (e.g., massage and walking therapy), forest therapy, water therapies (e.g., hot springs), natural food cures, animal therapy, hortitherapy, art therapy, aromatherapy, relaxation, massage, and mindfulness meditation (Japan Tourist Association, 2010).

There are few RCTs and meta-analyses examining the effects of such therapies on different types of depression; however, there is reliable research suggesting that aerobic exercise, such as walking or cycling, have antidepressant effects. In addition, there is evidence that engaging in exercises such as walking, running, or cycling more than once a week in natural environments (such as forests or public parks) can halve the risk of mental health issues compared with taking exercise indoors (Mitchell, 2013). Japan possesses many types of natural environment, such as mountains and rivers, wetlands, and many beautiful hot springs that are perfect places for training and therapy. One meta-analysis showed that the healing effect of nature is more pronounced in waterside locations (Barton & Pretty, 2010).

Mindfulness meditation has become very popular now both in Japan and other countries such as the United States. One meta-analytic study showed that mindfulness-based therapy can help depression (Hofmann, Sawyer, Witt, & Oh, 2010). Mindfulness is a process that cultivates a state of open awareness of thoughts and bodily sensations together with the regulation and control of attention and thought; it appears to help prevent depression and can benefit treatment-resistant depression.

Moyer, Rounds, and Hannum (2004) found that massage performed by professionals had a beneficial effect on depression, and one meta-analysis found a similar effect for relaxation (Morgan & Jorm, 2008). However, evidence for the effects of aromatherapy and water therapy on depression is so far inconclusive (Morgan & Jorm, 2008). It is important, however, not to confuse “no evidence of effect” with “evidence of no effect.” Hope and expectation about the effects of particular health interventions may lead to hasty criticisms of different therapies.

Popular recommendations for depression used to focus on rest and adequate sleep. However, the evidence now suggests that active therapy is more beneficial, and this is now the standard intervention for depression (Cuijpers, van Straten, & Warmerdam, 2007b). In the United Kingdom, it is the first-line treatment for depression. Long-term observation of complementary therapies for depression is necessary to determine the existence of side effects. In addition, even if a therapy fails to show a strong effect on mental illness, it may have a synergistic effect combined with more mainstream treatments. For example, a combination of pharmacological therapy and psychotherapy can often have a stronger effect on depression than either treatment administered singly. In addition, the relative effect of a particular therapy must be considered. For example, forest therapy alone may not have a strong antidepressant effect. However, walking in a natural environment (e.g., a forest or riverbank) has been shown to be more effective for depression than walking in the city (Barton & Pretty, 2010; Mitchell, 2013). Health tourism packages may be able to offer combinations of interventions, such as meditation and group psychotherapy, in addition to other activities.

**SPA INDUSTRY**

In Japan, the culture of spas has been imported from other countries and assimilated into everyday life. In recent years, there has been more growth in companies offering spa services and therapists (e.g., hotels, department stores, medical centers) than in natural spa resorts and other aspects of the fitness industry in Japan. Naturally, there is competition between similar spa services for a share of the market. The lack of a standard service definition means that it is difficult to determine precisely the size of the spa industry, the magnitude of sales, or the number of employees.

In comparison with health tourism programs, domestic users of Japan’s spa services benefit from the large number of spa services that are easy to access in familiar surroundings, such as hotels and shopping malls. It is difficult to determine whether many people seek spa treatment for depression. However, spa treatments may be
attractive in stressful times as they offer healing and relaxation; therefore, it is likely that demand will increase and the market will expand, making the future of such services rosy.

Spa programs in the future are likely to also include yoga, taijiquan, meditation, medical care consultation, psychology education, and fitness training. A report on spa services by the Mitsui Information Research Institute in 2009 announced predicted growth for the spa industry because of its association with the promotion of mental health.

**EDUCATION INDUSTRY**

The fitness, tourism, and spa industries have begun to incorporate meditation, mindfulness, and psychological/educational interventions that include stress relief, lectures on communication skills, and psycho-educational workshops. However, few programs that incorporate stepped interventions are explicitly marketed as treatments for depression. It is important that such interventions meet ethical, legal, and medical standards in defining and treating depression. Psycho-educational interventions can also incorporate other, more physical approaches such as walking, sensual therapies such as aromatherapy, and nutritional therapies using herbs and supplements. Combining therapies can produce a synergistic effect and increase user satisfaction. For example, psychological techniques such as meditation can be combined with physical exercises like yoga.

Meta-analytic studies suggest that mindfulness, group therapy, and CBT have positive effects on major depression; these therapies may also help non-clinical depression. Research suggests that group CBT is no less effective than individual CBT (Huntley, Araya, & Salisbury, 2012). These therapies often achieve effects by helping people with non-clinical depression educate themselves about their problems and acquire skills to engage in activities that help their mood.

Individuals with non-clinical depression, rather than major depression, have a better self-image and are more likely to be amenable to affirmative psychological approaches such as emotional intelligence training. For example, a meta-analysis by Bolier et al. (2013) indicated that positive psychology-based programs can significantly improve depressed mental state, increasing feelings of happiness and positive mood.

Similarly, several approaches have used coaching to enhance performance. For example, cognitive-behavioral coaching (based on CBT) has become popular in the United Kingdom (Palmer & Gylensten, 2008). A recent systematic review indicated that neurolinguistic programming has a significant effect on anxiety (Sturt et al., 2012).

The market size of the Japanese education industry in 2011 was 2.422 billion yen, a decrease of 0.7% compared with the previous fiscal year, according to the report “2012 Results for the Education Industry Market,” published by Yano Economic Research Institute. The examination cramming school market for students occupies a little over one-third of the whole market (924 billion yen) and rose 1.0% compared with the previous fiscal year under the influence of a 2-year consecutive study by the Japanese Government. However, the corporate training service market (452 billion yen, a 2.4% decrease compared with the previous fiscal year), the e-learning market (just over 100 billion yen, a 5.0% decrease compared with the previous fiscal year), and the correspondence course market (nearly 300 billion yen, a 2.1% decrease compared with the previous fiscal year) all decreased.

One problem is the strong influence of the declining birthrate in Japan, which is expected to have mid- and long-term effects on the cramming school market. However, the evidence indicates a large potential market for educational programs that go beyond simple relaxation and recreation to treat non-clinical depression.

There has been a drop in the popularity of CCBT because mental health self-help and teaching materials are not user-friendly or entertaining enough; these need to be improved so that they are more fun to use. The education industry needs to use basic educational techniques and attractive teaching materials to appeal to people with mental health problems. The use of educational techniques such as correspondence courses and the incorporation of education within businesses can help in maintaining access for individuals with mental health problems. The existing experience and knowledge in these industries can help generate more widely available services for mental health.

In Japan, a new type of depression affects the younger generations (people in their teens and twenties) and examples of this need to be included in the definition of non-clinical depression. Traditional treatment approaches to this new type of depression have encouraged the dependency of the patient by excessive intervention; more liberating approaches that encourage maturity in dealing with depression are needed. Standard depression treatments and psychiatric counseling have limited effects on this type of depression, suggesting that modern approaches to this new type of depression should incorporate educational interventions, such as business coaching or workplace mentor systems involving mentoring by senior colleagues.

**EFFECTIVENESS AND EVIDENCE FOR THE SIX INDUSTRIES**

There is evidence from the fitness and IT industries of the feasibility of offering interventions for non-clinical depression. The six industries mentioned in this paper may be able to provide such interventions; particularly as there is a British precedent for this. The profitability of CCBT in Japan has not yet been confirmed. The
technological development and convenience of CCBT may be improved in the future to make it more commercially attractive; marketing strategies will be important in this effort.

As there is some evidence for the effectiveness of health food supplements, these products have become very popular and there is already a large trade in e-commerce of so-called mental health supplements in the health food industry, which is likely to expand the market. However, excessive intake of some of these products has been linked to health risks, and legislation is needed to raise awareness of possible problems and to perhaps limit the amount of supplements that people can purchase in one transaction.

Unlike with the fitness, IT, and health food industries, evidence of the effectiveness of health tourism and spa services for depression is quite weak and there is a need for more investigation in the future. In recent years, the popularity of mindfulness and meditation practices for mental health has increased in Japan and there is some evidence for their effectiveness. Therefore, there is a possibility that health tourism programs offering these interventions in scenic resorts may develop in the future.

The strengths of the education industry lie in the use of existing knowledge, together with the development of correspondence courses with attractive teaching materials and the advantage of Internet use. This should increase future participation in educational interventions for non-clinical depression.

COMMON PROBLEMS

Finally, I address common problems that characterize the six main industries that provide mental health services for non-clinical depression. The first problem is that more research evidence is needed from RCTs. Meta-analytic studies of RCTs are now considered very important in determining the effectiveness of medical treatments. There have been fewer RCTs in Japan than in other developed countries; most of the RCTs that I refer to in this paper were performed abroad. RCTs are often conducted to examine specific therapeutic drugs or health foods. If the company making the product is responsible for the research, this raises doubts about the objectivity of the research findings; this is a particular concern with mental health services offered by private companies.

The second problem is ensuring that service users are given correct, unbiased information about the effectiveness of mental health interventions. There are now meta-analytic studies of evidence from fitness, IT, and health food interventions, but articles summarizing the evidence are often written in English using technical terms. This means that they are not very accessible to lay people, because many Japanese people do not have good English language skills. What is needed is regular investigation and clear, accessible reporting by research institutes that are objective from a national and international perspective.

Another problem is the simultaneous demand for mild interventions for non-clinical depression from the private sector and the difficulty that companies have in meeting the laws and regulations (such as the Medical Act or the Drugs, Cosmetics and Medical Instruments Act) and thus preventing risks to consumers. Many companies market “stress relief” psychological treatments for healthy people but rarely include non-clinical depression in their marketing efforts. This is because of a risk aversion to meeting legal requirements. The boundary between a mild non-medical intervention for non-clinical depression and a medical treatment is difficult to judge. and if a person without medical training performs what is interpreted as a medical treatment, then they risk violating the law. Companies need to make this boundary clear so that consumers are reassured about the legitimacy of the services offered.

Advertising can also be a problem. If companies profess to offer health-related interventions, they need to support these with evidence of effectiveness. In addition, there are legal restrictions on advertising pharmaceutical products before approval (the Drugs, Cosmetics and Medical Instruments Act), making false claims about products (Specified Commercial Transactions Law), and the use of evasive marketing strategies (Consumer Contract Law). Unless the boundaries between legal and illegal products and services are clarified, businesses will hesitate to offer mild intervention services for depression. While it is necessary to avoid interventions that could aggravate mental health problems, legislation that unduly restricts services is not helpful. The future development of the health industry depends upon achieving a satisfactory balance between service availability and appropriate standards.

CONCLUSION

There is a need for greater choice of evidence-based treatments for non-clinical depression, and the development of more services will benefit the national economy and risk management in each workplace. The large-scale advertising campaign in Japan that promoted the concept of depression encouraged people to rely on diagnoses of mental illness and prevented them from thinking for themselves. Autonomous self-management of mental health by healthy people does not depend on medical treatment or counseling and can encourage people to be better informed about mental health.

The development of attractive, entertaining programs, based on good evidence, will help to promote the use of self-help therapy for non-clinical depression and reduce dropout rates at workplaces. Accordingly, these programs could be innovative management tools to improve risk management and workplace productivity. Unfortunately, the medical industry has fallen behind with research and development in this gray area. Therefore, it is essential to draw on knowledge and experience in other industries. Current evidence suggests that the most
effective method for reducing depression and increasing quality of life is CBT (Cuijpers et al., 2007b); further development of this field should be a high priority.

There are increasing opportunities for organizations to incorporate psychology in the workplace. As a result, there may be improvements in screening of people for high-risk psychiatric problems. Psychological education at workplaces may reduce unnecessary hospital consultations and inappropriate prescriptions and prompt the use of alternative mental health services. This may help to reduce the strain on the public medical system, which is exacerbated by Japan’s aging society. Increased personal awareness about mental health issues will be reflected in a healthier balance in society.

The problems that mental illness creates in the workplace, such as lack of engagement, drop out and absence from work, demand more innovative risk management policies to halt the decline in productivity. Incorporating services from the fitness, health food and IT industries will help to change the management of mental health-related risks in organizations.

REFERENCES


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IMPACT OF EMPLOYEE MOTIVATION ON JOB SATISFACTION IN HIGHER EDUCATION INSTITUTE IN OMAN

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ABSTRACT

The study aims to depict the phenomena related to Impact of Employee Motivation on Job Satisfaction in Higher Education Institute in Oman. A combination of descriptive and conclusive research design was adopted to describe and report the related phenomena. An university of Oman was chosen for study. Sample frame consisted of all the academic staff teaching in various departments of the university. The sample size consisted of 50 academic staff.

Study indicated that motivation level of academic staff had a positive influence on their job satisfaction. The motivation level was influenced by appreciation and expectancy of academic staff. Job satisfaction was found to be influenced through supervision, promotion, teaching, pay, fringe benefits, research and student and staff competencies.

Based on the review of literature relatively a very few studies targeted on university teachers in universities of Oman with related variables.

Keywords: Employee motivation, Job satisfaction, Higher education, Oman,

INTRODUCTION

Motivation as a component is the main source of energy in our job. As indicated by Baron (1983), motivation is an aggregation of distinctive procedures which impact and direct our conduct to attain to some particular objective. It is an important element in the present scenario which gives a remarkable total positive effect on work. Only employees who are motivated and who are well dedicated can execute the best job in any institution. Accordingly Kreitner and Kinicki (2004) agree that motivation is "those mental techniques that cause the arousal, heading and perseverance of willful activities that are objective coordinated." Motivation partially depends upon certain self interest of individual, and in addition, outward figures which joint effort brings about completely dedicated employees. As indicated by Board (2007), motivations that are not to be mistaken are compelling in stretching out execution for assignment which was not done until recent times, to energize "thinking more quick witted" and to backing both quality and amount to attain to objectives. Motivators, prizes, rewards are the very important components that have a positive impact on employee motivation.

Albeit there have been a few Job satisfaction studies, not very many of them have concentrated on the job satisfaction of the teachers in the Colleges. Colleges are the communities for giving advanced education which is an irreplaceable formative foundation for any nation. Colleges on the planet over are relied upon to look for and develop new learning, give the right sort of initiative in all Jobs of life and endeavor to advance uniformity and social equity. These destinations can be accomplished when there is job Satisfaction among the staff in the academic. The motivation behind this study is to discover the effect of motivation on job Satisfaction of academic faculty at Higher education institution in Oman.

LITERATURE REVIEW

At present, organizations focus mainly on the sensible harmony with employee responsibility to the execution of organization. Complements and rewarding tactics help to serve as the most unforeseen calculation keeping interested employees self esteem great and enthusiastic. Once Oosthuizen (2001) felt that the directors capacity to spur the employees effectively and impact their conduct to accomplish more prominent authoritative productivity. In fact La Motta (1995) proposes that delivering in a job is due to the effect of capacity and motivation. As per Wilson (1994), methodology of executing administration is a key component of aggregate prize frame Job.

As per Entwistle (1987) an effective employee performance which has prize component is guided by motivation. The examinations that have been directed to discover the relationship in the middle of remuneration and people were cantered to expand the execution of staff (Ciscel, 1994). Exceptionally energetic staffs support as the upper hand for an organization on the grounds that their execution drives the group to great achievements and attain the objectives.

Compared to budgetary, conservative and human assets, human assets are necessary keys that can give an organization aggressive edge when contrasted with others. Lawler (2003) contended by proposal of flourishing
and organizations survival is resolved by the individual assets and by the way of dealing with them. The vast majority of organizations have picked up the tremendous advance by completely consenting to their business system through a decently adjusted prize and reward plans for worker. Deep Rose (1994) contended that employee motivation and their profit could be upgraded by giving different viable reward that eventually brings about enhanced execution of institution. Entire accomplishment of an institution is taken into account by keeping its employees spurred and in the way they assess their execution of individual for job pay.

As per Freedman (1978) prozes and rewards led to employees performing better than the expectations. Employees take reward as their sentiments of quality and thankfulness and subsequently it helps up resolve of employee which at last builds gainfulness of organizations. He sets a view that the condition of satisfaction is attained by the employees just when they maximally put their capacities in performing the exercises and capacities at Job.

Flynn (1998) suggested that rewards enhance the motivation level of employees. The prizes incorporate the monetary remunerates, pay and profits, advancements and motivators that fulfill employees to some degree yet for submitted employees, reward must be given to keep them roused, acknowledged and conferred.

Employees are motivated and in high spirit completely when their needs are met. The motivation level of employees enhances when they get an unforeseen increment in reward, acclaim and pay (La Motta, 1995). In today's element surroundings the profoundly energetic employees serve as a cooperative energy for achievement of organization's objectives, strategies for success, high productivity, development and execution. Motivation is likewise obliged when the hierarchical Work force has not a decent relationship design. Employees' connection with Employees and with director is a key fixing of the inward quality of the organization. The capacity of chiefs to give solid authority has an impact on job satisfaction of employees. The study relates how the effect of impetuses, prizes and reward projects drives employee motivation.

Prizes are related to the method of motivation which have become a necessary part in considering in job execution. Once Lawler (2003) proposed that attractive amount of a prize can be measured by two variables, one is how the individual values the prize given and the other is how the prize is measured. According to Deeprose (1994) "Good boss analyze employee’s achievement and recognizing them and reward them by issuing them a justified prize."

Certain risks are predicted in advancement as proposed by employee's level and aptitudes motivate employee faithful to their institution and make them a wellspring of applicable job ability for the individual. Lawler (2003) views that more the achievement in difficult tasks for an employee, more he or she reach their potential and prove their ability and capacity with full job satisfaction. Complements like prizes, rewards are the major motivating forces at present in any institution to drive employee’s potential in majority of organizations.

Robbins (2001) attests that promotions open the door for self-awareness, stretched out levels of obligated feeling and their standing in the society. At the same time, the reward plays an important role in employee motivation who worships with thankfulness and relegates a level not withstanding being a employee of the organization. Expression of Wilson (1994) is that an individual should earn his restrictive reward with his own endeavors which is obtained with a feel of accomplishment of a result of an activity. Employees with significant satisfaction with their life with legitimate rewards in their work are more likely to be closer to the organization. Complements like rewards promote the benefit level and job execution even if it is first time execution or rehashed action at the job in a dynamic manner. Gagne (2009) researched that natural motivation is beneficial for delivering inventive Job, and forced motivation is not favorable to creating imaginative Job. Researchers affirmed that there is a measurably critical relationship in the middle of prize and reward individually, additionally motivation and satisfaction. The study uncovered that if prizes or reward offered to employees were to be adjusted, then there would be a comparing change in job motivation and Satisfaction.

Morteza, Abas and Soheil (2013) reveal that there is a remarkable difference with different variables in motivation factor in job satisfaction among faculty members. Social values and religious values have a role to play in working atmosphere. They also reveal that there is a impact of supervisors, colleague in the institution. Values in preference among faculty members of different branches are prioritized respectively as economical values, social values, political values, theoretical values, religious values and religious values. They found out that religious values have a significant positive relationship with motivation and job satisfaction. Imran, Mushtaq and Qudsia (2013) say that the most of faculty member in university are not motivated by the administration policies and they show their dissatisfaction with the salary and rewards. They also prove that the administration is totally responsible for their low motivation.

Here Imran and Qudisa indicated that most of the teachers do not get rewarded for their hard work either materialistic or by promotion. Faculty members in education area have to be motivated by training, promotion policies, working environment and some social factors science they play important role in society. Incentives have a major role in motivating a staff and it is a challenge for the administration to provide legitimate and correct technique in delivering it.
HYPOTHESES & RESEARCH MODEL

Based on the survey of available research in the area of motivation and job satisfaction the following hypotheses are proposed for the study:

*H1*: There is a positive relationship between extrinsic reward (pay) and employee motivation. *H2*: There is a positive relationship between intrinsic reward (appreciation) and employee motivation.

*H3*: There is a positive relationship between training and employee motivation. *H4*: There is a positive relationship between expectancy and employee motivation.

*H5*: There is a positive relationship between employee motivation and job satisfaction. *H6*: There is a positive relationship between supervision and job satisfaction.

*H7*: There is a positive relationship between promotion and job satisfaction.

*H8*: There is a positive relationship between working condition and job satisfaction.

*H9*: There is a positive relationship between teaching and job satisfaction.

*H10*: There is a positive relationship between pay and job satisfaction.

*H11*: There is a positive relationship between fringe benefits and job satisfaction.

*H12*: There is a positive relationship between research and job satisfaction.

*H13*: There is a positive relationship between student and staff competency with job satisfaction.

**Fig 1: Conceptual Model**

RESEARCH METHODOLOGY

The study is both exploratory and descriptive in nature. Exploratory research was undertaken to have a comprehensive understanding of the problem being investigated. Descriptive research was done subsequently and a questionnaire and scale was adapted from similar studies to collect primary data from the respondents.

**Sample size**

A sample of 50 university teachers was selected for the study. The sampling method used was convenience sampling.

**Questionnaire**

The questionnaire was adapted from Zafar, (2014) and Giles and Field (1978). The variables affecting motivation and job satisfaction were adapted from above mentioned studies for the research work.

**Data analysis**
Cronbach’s Alpha for Scale items

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<td>.963</td>
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<td>.729</td>
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<td>.785</td>
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<tr>
<td>.917</td>
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<td>Overall</td>
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As per table 1 it is evident that alpha value is greater than .7, which is high and indicates strong internal consistency among different scale item.

DISCUSSION ON FINDINGS OF THE STUDY

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**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
$H1$: There is a positive relationship between extrinsic reward (Pay) and employee motivation. $H_{01}$: There is no relationship between extrinsic reward (Pay) and employee motivation.

According to the statistical value exhibited in table no (2), it quite evident that null hypothesis $H_{01}$ dose not gets rejected ($r=0.660, p=.000$). That is to be concluded that extrinsic rewards and motivation has no relationship.

$H2$: There is a positive relationship between intrinsic reward (appreciation) and employee motivation.

$H_{02}$: There is no relationship between intrinsic reward (appreciation) and employee motivation.

According to the statistical value exhibited in table no (2), it quite evident that null hypothesis $H_{02}$ gets rejected ($r=0.401, p=.001$). That is to be concluded as if appreciation are high (lower) the job satisfaction can be higher (lower). Moreover middle value of coefficient correlation ($r=0.401, p=.000$) indicate moderate, although significant correlation between the said variables.

$H3$: There is a positive relationship between training and employee motivation. $H_{03}$: There is no relationship between training and employee motivation.

According to the statistical value exhibited in table no (2), it quite evident that null hypothesis $H_{03}$ does not get rejected ($r=0.216, p=.000$). That is to be concluded that training and motivation has no relationship.

$H4$: There is a positive relationship between expectancy and employee motivation. $H_{04}$: There is no relationship between expectancy and employee motivation.

According to the statistical value exhibited in table no (2), it quite evident that null hypothesis $H_{04}$ gets rejected ($r=0.417, p=0.01$). That is to be concluded as if expectancy are higher (lower) the job satisfaction can be higher (lower). Moreover middle value of coefficient correlation ($r=0.417, p=0.01$) indicate moderate, although significant correlation between the said variables.

$H5$: There is a positive relationship between employee motivation and job satisfaction. $H_{05}$: There is no relationship between employee motivation and job satisfaction.

Table 3: Correlations between motivation and job satisfaction

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According to the statistical value exhibited in table no (2), it quite evident that null hypothesis $H_{05}$ gets rejected ($r=0.350, p=0.05$). That is to be concluded as if motivation are higher (lower) the job satisfaction can be higher (lower). Moreover a low value of coefficient correlation ($r=0.350, p=0.05$) indicate a weak, although significant correlation between the said variables.

$H6$: There is a positive relationship between supervision and job satisfaction. $H_{06}$: There is no relationship between supervision and job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{06}$ gets rejected ($r=0.672, p=0.01$). This is to be concluded as if employee supervision is higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r=0.672, p=0.01$) indicate moderate, although significant positive correlation between the said variables.

$H7$: There is a positive relationship between promotion and job satisfaction. $H_{07}$: There is no relationship between promotion and job satisfaction.
Correlations between Job Satisfaction and Select Variables

Table: 3 Correlations between Job Satisfaction and Select Variables

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**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

H8: There is a positive relationship between working condition and job satisfaction.
H08: There is no relationship between working condition and job satisfaction.
According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{08}$ gets rejected ($r= 0.630, p=0.01$). This is to be concluded as if working condition are higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r= 0.630, p=0.01$) indicate moderate, although significant correlation between the said variables.

$H_{09}$: There is a positive relationship between teaching and job satisfaction.

$H_{09}$: There is no relationship between teaching and job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{09}$ gets rejected ($r= 0.673, p=0.01$). This is to be concluded as if teaching basis are higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r= 0.673, p=0.01$) indicate moderate, although significant correlation between the said variables.

$H_{10}$: There is a positive relationship between pay and job satisfaction.

$H_{10}$: There is no relationship between pay and job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{10}$ gets rejected ($r= 0.541, p=0.01$). This is to be concluded as if payment are higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r= 0.541, p=0.01$) indicate moderate, although significant correlation between the said variables.

$H_{11}$: There is a positive relationship between fringe benefits and job satisfaction.

$H_{11}$: There is no relationship between fringe benefits and job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{11}$ gets rejected ($r= 0.605, p=0.01$). This is to be concluded as if fringe benefits are higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r= 0.605, p=0.01$) indicate moderate, although significant correlation between the said variables.

$H_{12}$: There is a positive relationship between research and job satisfaction.

$H_{12}$: There is no relationship between research and job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{12}$ gets rejected ($r= 0.797, p=0.01$). This is to be concluded as if research area are higher (lower) the job satisfaction can be higher (lower). Moreover, high value of coefficient correlation ($r= 0.797, p=0.01$) indicate a strong, although significant correlation between the said variables.

$H_{13}$: There is a positive relationship between student and staff competency with job satisfaction.

$H_{13}$: There is no relationship between student and staff competency with job satisfaction.

According to the statistical value exhibited in table no (3), it quite evident that null hypothesis $H_{13}$ gets rejected ($r= 0.689, p=0.01$). This is to be concluded as if student and staff competency are higher (lower) the job satisfaction can be higher (lower). Moreover, middle value of coefficient correlation ($r= 0.689, p=0.01$) indicate moderate, although significant correlation between the said variables.

**FINDINGS**

- It has been found that there is positive and moderate relationship between supervision and job satisfaction. It is thus concluded that effective supervision will improve job satisfaction of academic staff.
- It has been found there is positive moderate relationship between promotion and job satisfaction. It can be thus concluded that promotion improves job satisfaction.
- It has been found there is positive and moderate relationship between working condition and job satisfaction. It can be thus concluded that effective working condition will improve job satisfaction of academic staff.
- It has been found that there is positive and moderate relationship between teaching and job satisfaction. It can be concluded that the effectiveness in teaching component will improve job satisfaction.
- It has been found there is positive and moderate relationship between payment and job satisfaction. Thus shows payment will effect job satisfaction.
- It has been found there is positive moderate relationship between fringe benefits and job satisfaction. Thus employees should be provided with fringe benefits for enhanced job satisfaction.
- There is high positive relationship between research component and job satisfaction. It can be concluded that effective research of faculty members will improve job satisfaction.
- It has been found there is positive relationship between staff competency and job satisfaction. Hence the competent staff will be more satisfied with their job.
• There is low positive relationship between motivation and job satisfaction. This indicates that a motivated staff will feel satisfied.
• There is positive and moderate relationship between intrinsic reward (appreciation) and motivation. This can be concluded that appreciation will make staff motivated.
• There is no relationship between training and motivation.

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MOBILE ENGAGEMENT, MOBILE ADDICTION AND FOMO:
A CONCEPTUAL FRAMEWORK BASED ON LITERATURE REVIEW

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ABSTRACT

The rapid amelioration of Internet technology and the advancement of communication-enabling apps have made online lives much more diverse and have helped people integrate. However, the need for socializing and keeping abreast with all the information related to friends and acquaintances cannot be undermined. Therefore bigger the social circle more is the time spent online. The increased mobile engagement has further given rise to a fear or more specifically, the “Fear of Missing Out” (FOMO). When the need to interact gets morphed into an addiction, the level of engagement reaches a point, where an individual begins to feel psychologically and/or emotionally disturbed. With such disturbances, especially FOMO being the focus of this study, a review of extant literature on the subject lead to a conceptual framework (proposed) comprising of 3 constructs, viz.: Mobile Engagement, Mobile Addiction and FOMO. The relationship between these constructs is examined and greater insights obtained by elucidating the factors influencing them. This paper will widen the scope of research to scholars, students and others interested to delve deeper in this field of study.

Keywords: FOMO; Mobile Engagement; Mobile Addiction; Conceptual Framework

1. INTRODUCTION

During the last three decades, mobile phones have become a powerful tool for communication. Mobiles have provided a way of integrating and connecting people. Moreover, with the upgradation and enhancement of Internet facilities, and introduction of advanced mobile apps, there has been an elevation in the usage of these devices. As per the findings of a report by StatCounter Global Stats (2014), the use of mobile devices to access the Internet world over has soared by 67% [1]. The anytime-anyplace connectivity has lead people to constantly use their mobile phones for updates and notifications [2]. With the convenient availability of abundant information on any aspect, individuals tend to engage themselves for longer durations on their mobile phones. Further, due to a large number of contemporary mobile apps developed on a continuum, it is witnessed that the inclination of people towards mobile engagement is increasing phenomenally. Therefore, the strong drive for keeping oneself psychologically and emotionally nourished with the social updates from friends and acquaintances is one of the major effects of mobile engagement. Managing relationships which directly have an influence on the social interactions and the desire to accomplish something are often accompanied by anxiety. Social media and the wide array of apps that it offers, has engaged people to a large extent. Social networking sites such as Facebook have at least 802 million active users who log on to Facebook everyday out of the 1.82 billion users, as per the statistics of March 2014 [3]. However, excessive and habitual use of mobile leads to addiction [4].

From the above mentioned discussion, it can be clearly inferred that, a healthy balance needs to be maintained between prioritizing the time spent browsing through social networking sites and having the ability to face personal interactions face-to-face rather than in the abstract world [4]. One must be focused on leading their lives in a normal way rather than getting distracted by others’ tweets and Facebook postings. People who feel insecure about their relationships and abilities are the ones who are much prone to mobile phone addiction which gives rise to FOMO as a result of certain targets or goals not being met [5]. According to a study conducted by Przybylski (2013), the three factors that drive FOMO are: competence, connectivity and autonomy [6].

The expectation of having some sort of rewarding experience is the general mindset of individuals which has occurred as a result of long-standing processes and norms of society [2]. This is how FOMO as a syndrome or a maladaptive preoccupation with Internet affects the society as a whole. This paper, therefore attempts to examine the relationship between mobile engagement of users and the FOMO as experienced by them. Further this study also attempts to examine the role of mobile addiction in the relationship between engagement and FOMO. The constructs and the relationships established and proposed between them have been presented in the next section.
2. LITERATURE REVIEW

2.1. Mobile Engagement

Around 80% of the total world’s population today owns a Mobile Phone [7], a device which had once originated to help people keep in touch with one another. However, today due to the increased availability of mobile tools and apps, the need has transformed itself into engagement. The apps and their operating mechanisms have managed to create a “WoW Effect” on the users, thereby leaving them wanting to explore more and more of the virtual world. Berlin Fang (2009) has aptly denoted mobile engagement as the technology-enabled distraction, a problem that no educator can afford to ignore as ubiquitous computing and mobile learning environments become commonplace. Unwanted side-effects ranging from distractions, disruptions to engagement are all the cons of technology which has lined the digital learning environment [8].

Mobile Engagement depends on the background of people and the environment in which they live. The society also influences the level of engagement of an individual to one’s mobile device. In some countries, people are very less dependent on mobile phones and prefer to perform tasks manually, as they believe that it is a better and self-dependent way of achieving goals. Some of the primary reasons related to increased mobile engagement include easy availability of various applications such as WhatsApp, Facebook, Instagram, Snapchat, imo and many more. Some of these apps have become a part and parcel of people’s daily routine. A person’s social life online determines how engaged he/she is on his/her mobile phone having Internet connectivity. An individual with bigger social network online is more likely to be active with the mobile phone as compared to one who has a smaller social circle (online). One of the results of a research study undertaken by Moira Burke (2010) and some other similar studies was that people who felt that there was a gap between the social interactions they currently had and those that they desire tend to spend more time observing other people’s interactions on social networking sites [9].

As per the statistics by Go-Globe.com, 89% of smartphone users use their devices throughout the day [7]. However, the frequency of usage may either be low or high. Moreover, a high mobile engagement generally leads to mobile addiction. It is because the person is so engaged and engrossed with his or her device, always wanting to be connected to the device and does not want to miss out on a call or text or a notification. This leads to a tendency of a mobile user to be immediately responsive to any alert on his/her device. However, this kind of behavior makes it difficult for him/her to stay away from his/her mobile device.

In this study, mobile engagement refers to the perturbed or distracted state of mind resulting from the increased use of mobile phones, which hampers the productivity of students, thereby giving rise to less self-dependency in achieving their goals.

2.2. Mobile Addiction

Addiction by definition denotes a negative attribute and thus anything done in excess of the normal is considered as an addiction. An article on addiction by Tessa Jones (2014) quotes a definition by Alagheemandanhas as “whenever a habit changes into an obligation, it can be considered as an addiction” [10]. Tessa Jones (2014) presented some interesting facts following a survey of a group of students in a University; texting was mentioned by 83.1 percent of students as the most used feature, followed by calling (10.8 percent), and Facebook, Twitter or Instagram by 1.5 percent each. More than half of the students surveyed said they believe they are addicted to instant and constant communication (56.9%). Students reported feeling disconnected (77.4%) and stressed (25.8%), besides other negative feelings when they don’t carry their mobile phones. Mobile addiction is extremely bad as it causes changes in the people’s behavior and psychological state of mind and they get very angry if someone keeps them from responding to any notification on their device. However, according to the study conducted by Jones (2014), students are aware about their addictive behavior but are not willing to come out of it [10].

In this study, mobile addiction refers to compulsive concern over checking one’s mobile phone repeatedly with the belief that one might have missed out on an important call or text. It leads to a disconnect or isolation from the real-world situation as a result of excessive indulgence in exploring the virtual environment (online).

2.3. Fear of Missing Out (FOMO)

FOMO can be called as a syndrome or a disorder that leaves a person feeling restless. It is symbolic of a strong addiction that traps the victims and ensnares them into a diabolic quagmire. Increased frequency of screen-use, obsessive checking of phone for messages or missed calls, are all symptoms of FOMO. As Bianca Bosker, Senior editor at the Huffington Post opines, “FOMO is the sometimes energizing, sometimes terrifying anxiety that you are missing out on something absolutely terrific. It could be a TV show, it could be a party, it could be a gadget, it could be that really good burrito from the food cart. The important thing to keep in mind with FOMO is that it’s not just a state of mind; it is also a physical reaction. So as a FOMO sufferer, I can report sweating, itching, pacing and compulsive refreshing of my Twitter feed” [11].
Social Networking Sites, apps and social media have given ‘Millennials’ the convenience of online social interaction. This has lead to a boon in self-branding and self-promotion, which a large number of individuals today crave for. However, this interaction over time has led to addiction and infected people from all age groups, irrespective of their social status, qualification or professional background. In fact, it has created a fear that they might miss out on something important and they will have to regret it later [12]. Dan Herman, a marketing strategist defined the term FOMO in 1996 as “FOMO is experienced as a clearly fearful attitude towards the possibility of failing to exhaust available opportunities and missing the expected joy associated with succeeding in doing so. Simply put, it is concentration of attention on the empty half of the glass” [12]. FOMO or the fear of missing out provides a way of escapism from the real world situations [13]. Increased exposure to social media and the need to keep oneself updated about what is going on in others lives, just to make a comparison as to how well we stand in our social circle in contrast to our friends or acquaintances. Wikipedia refers to FOMO “as a form of social anxiety, a compulsive concern that one might miss an opportunity and links it to social media” [14].

In the context of FOMO, even Przybylski (2013) suggested that social factors play a significant role. In a study conducted by him, it was found that if people’s “psychological needs were deprived” they were more likely to seek out social media and FOMO bridged that gap, explaining why people were using more social media than others [15]. Hence, the major factors or drivers that have led to this alarming syndrome (i.e. FOMO) seem to be the unfulfilled psychological or physiological needs. A transformation of the fundamental mindset caused by the technological revolution has made exhaustive options available. This has made it imperative that people try out most of these options or some of these options with high frequency. This constant feeling that grips an individual and keeps him/ her strongly motivated to check his/ her respective device(s), under the perception that he/ she may have received some information from near and dear ones. It is also a way of comparing the quality of lives, of concluding whether others have a more rewarding experience as compared to oneself. FOMO can also trigger feelings of negativity and depression. It makes the individual evaluate one’s self-worth and contemplate if one is at par with others in terms of their virtual networking relationships. FOMO can be said as a means to constantly be connected and socialize without any obstacles.

Based on the above mentioned discussion, some of the important characteristics of FOMO that emerge are:

- A feeling of unease that lasts in one’s psychology, as a result of reading others posts on social media sites
- Restlessness and unbalanced state of mind
- Emotional strain
- Low concentration on what is going on in the physical environment (completely disinterested)
- Enormous fear of failure on missing out opportunities
- Low self-esteem

In this study, FOMO is defined as a feeling which indicates felt deprivation from satiating one’s hedonistic pursuit of keeping oneself updated with what is going on, and probably leads to psychological, physical and emotional disturbances.

2.4. Mobile Engagement leading to Mobile Addiction

Mobile phone, besides being a communication tool, for the first users was a means to perform their work faster and better, thereby shortening the time taken for decision making. This had a huge impact on improving productivity and profitability in businesses. However, in time and with the advancement of technology this has made users slaves of the devices. A tool that should have been at the disposal of human beings today has become increasingly a substance of addiction [16].

In fact, mobile devices have changed the way people interact and communicate with each other. According to a research conducted in a university campus, over 64% of the students were found using their mobile devices in some way or the other for an extended period of time [10]. Students initially engaged the mobile devices to text using the normal messaging system (SMS). They were averse to making phone calls as it was expensive and would hurt their pockets, so voice calls were used only in emergencies. The advent of smart phones however resulted in a paradigm shift in the way mobile devices could be used. The currently available devices are packed with features that are hard to resist and the number of apps that are currently available make communication seem to be almost free of cost. The availability of a powerful device at an affordable price has brought the device within the reach of almost all strata of society. On the other hand, extensive marketing by major brands have converted the high end mobile devices as status symbols and a fashion accessory. It could be estimated that of all the marketing campaigns ongoing in any part of the world, mobile communication devices or telecom operators occupy the maximum time and space, out classing all other products and services. In an experiment conducted by Brian mentioned in an article by Tessa Jones (2014), two students were asked to go without phones for 48 hours. It was found that students experienced changes in their bodies and emotions. They started feeling restless, fidgety and had cravings of checking their phones for any missed calls or missed messages [10]. Based on the above mentioned discussion, it is proposed that:
P1: Increased Mobile Engagement of users will lead to Mobile Addiction.

2.5. Mobile Addiction and FOMO

The excitement of interacting with people both known and unknown, gives the users a sense of satisfaction, boosts their self-esteem and helps them come out of their dysphonic mood (includes depression, anxiety and isolation). Addiction to mobile apps is not just limited to teenagers and young adults; in fact it has gripped people from all age groups, irrespective of their profession. Once mobile phone addiction has occurred, it will perhaps logically lead to FOMO. It is an obsessiveness that an individual holds that they might miss out on something important if they don’t check their mobile app updates. In a nutshell, it can be called as “creating one’s own dimension” and “living to the fullest in the dimension”. Hence, it is proposed that:

P2: Increased Mobile Addiction will significantly influence FOMO.

2.6. Mobile Engagement and FOMO

Due to the easy availability of technology and a multitude of opportunities, individuals have created their own virtual world, made up of friends, relatives, acquaintances and even strangers. Increased mobile app engagement has paved the way for the FOMO syndrome. When constant notifications, status updates and texts become the reason for pacifying one’s emotional and psychological needs, it leads to FOMO. This phenomenon is common with adolescents who cannot stand the idea of missing out on certain happenings and are thus prone to check their mobile phones on a regular basis [2].

In one of the recent studies, a scale (C-FOMO) has been developed to measure the tendency that indicates one’s inclination towards mobile app engagement and FOMO. The objective of the scale is to test the intensity of relationship between the mobile app engagement that leads to FOMO. The original scale which was developed by Dr. Andrew Przybylski to measure FOMO was revised and the revised scale (C-FOMO) encompasses 5 major dimensions, viz.; General Items, Social Items, Safety Items, News Items, Work/ School Items [2]. These dimensions more specifically capture areas where FOMO is prevalent on a larger scale. Hence, it is proposed that:

P3: Increased Mobile Engagement will lead to a significant increase in FOMO.

3. CONCEPTUAL FRAMEWORK

A theoretical model has been developed based on a deeper understanding and analysis of the topic. The three constructs in the proposed and conceptual framework are Mobile Engagement, Mobile Addiction and FOMO. The essence of this model is in testing the nature and degree of relationship amongst the three constructs depicted in the diagram (Fig. 1). The various factors associated with these constructs are instrumental in knowing how much each construct is related to another. And whether or not, the relationship amongst constructs (if any) are significant.

Fig. 1 Proposed Conceptual Framework
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of FOMO, proposition P2 attempts to explicate the relationship between Mobile Addiction and FOMO. Moreover, it seems quite logical to expect that Mobile Addiction will mediate the relationship between Mobile Engagement and FOMO of an individual, which can be examined by an empirical investigation of the proposed research model (Fig. 1). The findings of the empirical study can even highlight the nature of plausible mediation, i.e. existence of partial or complete mediation. For the said purpose, a structured-undisguised questionnaire comprising statements (refer Table 1) be developed and administered on a targeted set of potential respondents and data be analyzed appropriately using Partial Least Squares Structural Equation Modeling (PLS-SEM) techniques.

Table1: Description of constructs used in the study

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Question Nos. (Statements)</th>
<th>No. of scale items</th>
<th>Source (adapted from)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Engagement</td>
<td>1-5</td>
<td>5</td>
<td>Przybylski et al., 2013</td>
</tr>
<tr>
<td>Mobile Addiction</td>
<td>1-17</td>
<td>17</td>
<td>Leung, 2007</td>
</tr>
<tr>
<td>FOMO</td>
<td>1-10</td>
<td>10</td>
<td>Przybylski et al., 2013</td>
</tr>
</tbody>
</table>

As mentioned in Table 1, the data collection instrument (questionnaire) shall comprise four sections. The first section of the questionnaire shall comprise five scale items for Mobile Engagement; the second section shall comprise seventeen scale items relating to Mobile Addiction; the third section shall comprise ten scale items to measure FOMO and the fourth section shall comprises of select questions to capture respondent’s profile, esp. demographic profile.

4. CONCLUSIONS

Based on the review of extant literature, this paper proposes a conceptual framework that attempts to explain the relationship between the three constructs viz.; Mobile Engagement, Mobile Addiction and FOMO. With each of these constructs exposed to intensive research independently in past studies, the researchers and academicians interested in this field of study, proves instrumental in elucidating the relationship between the three constructs and their profound impact on the overall personality of an individual.

5. LIMITATIONS AND FUTURE RESEARCH

This study provides a conceptual framework and propositions, which were constructed based on literature review and analysis. However, these propositions were not empirically examined. This research framework can also be extended taking into account demographic and psychographic variables. In this study the scope is limited to college students but this can be applied to other social groups as well. Future investigations and studies can be carried out on groups such as working individuals to find out the impact of their FOMO.

6. ACKNOWLEDGEMENTS

The authors would like to express their gratitude to Ms. Alaya Zayid Ali Al-Siyabi and Ms. Intisaar Khalfan Masallam Al-Habsi, students of BBA programme at Waljat College of Applied Sciences, for their inputs in this research study. We appreciate their coordination and contribution towards the development of the research framework proposed in this paper.

REFERENCES


SOCIAL RESPONSIBILITY OF A UNIVERSITY LIBRARY: A CASE STUDY OF PT RAVISHANKAR SHUKLA UNIVERSITY, RAIPUR, CHHATTISGARH, INDIA

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ABSTRACT
Study was conducted in Pt. Sundarlal Sharma Library of Pt. Ravishankar Shukla University, Raipur, Chhattisgarh (India), with an objective that how the university libraries can be made more socially responsible. It is one of the oldest and biggest libraries in the central India, spending huge amount on its collection, staff and maintenance. Few noteworthy findings have been presented along with meaningful suggestions.

Keywords: social, responsibility, university, library.

1. INTRODUCTION
In the inaugural address of National Knowledge Commission on 2nd August 2005, our Prime Minister, Dr Manmohan Singh, has recognized Public Libraries as an extremely important element in Knowledge Economy. Considering this, the Working Group on Libraries was formed in 2005 had mentioned in their report that ‘Libraries has a social function in making knowledge publicly available to all. The role becomes more critical in making India a Knowledge Society’. The Working Group has also recognized following objectives of libraries:

i) disseminate knowledge as widely as possible,
ii) serve as a major vehicle to facilitate creation of new knowledge,
iii) facilitate optimal use of knowledge by all sectors, such as government, industry, rural sector and civil society,
iv) ensure that people from all sectors and all parts of country have easy access to knowledge relevant to their needs, in their own language.

The bottom line is ‘The libraries have to be and must be socially responsible’, therefore the question arises ‘How’?

Though it is an established fact that the condition of academic libraries in India in general and university libraries in particular, are in a better shape , due to University Grants Commission and State Governments, paradoxically it is also a truth that these libraries lagging behind their responsibility towards society, due to various reasons. Indeed it is a matter of great concern to the government and universities, but public at large. Therefore, the present study is a modest attempt in this regard. The study was conducted in Pt. Sundarlal Sharma Library of Pt. Ravishankar Shukla University, Raipur, Chhattisgarh (India). It is one of the oldest and biggest library in the central India, established in the year 1964 having 195000 books, subscribes 236 current journals, 7500+ online journals, and about 3000 Ph.D thesis. The library is largely meeting the needs of the students of Pt. Ravishankar Shukla University campus and research scholars enrolled under the University for their Ph.D programme. However, because of its rich collection of rare and latest books, journals, magazines, reports and newspapers, besides students and research scholars there is not only demand but pressure upon the higher authority and chief librarian to extend the library facility to many other interested stakeholders of our society.

2. OBJECTIVE OF THE STUDY
While the broad purpose of the present study was to identify the ways and means through which the university library can be made more socially responsible. As university library is strictly governed by rules, regulations, and policy of the university, in the present study an attempt has been made to:

i) Assess feasibility of university library to meet the growing demands and expectations of outsiders as a part of its social responsibilities;
ii) Find out what are their expectations of the stakeholders;
iii) Examine the impact of their expectations on the existing facilities and rules of the university with respect to library;
iv) Assess the opinion and reactions of university students towards this form of social responsibility of university library; and
v) Suggest the measures to be taken to fulfill the above social responsibility.
3. METHODOLOGY
In order to achieve the above objectives, the researchers decided to collect primary data. The data collection continued for 3 months. The data was collected from 300 respondents which constitute sample for the study with the help of a specially designed schedule having 15 questions. Data was analyzed with the help of percentage method to draw a meaningful finding and conclusions.

4. FINDINGS OF THE STUDY
Following were the major findings of the study:

1. Majority (80%) of the employees of the library were of the opinion that, while it will be a good proposition to open the library facility to interested outsiders but it is only possible if the university administration provide us additional staff to run the system. Interestingly 20% of them were totally against this idea with the opinion that it will overburden them and the students and researcher scholars may not enjoy the same facilities available at present.

2. While majority (92%) of female employees were against opening the facility to outsiders. Only 8% of them felt it can be opened but women employees should not be given additional work for this purpose.

3. Majority (72%) students and researcher scholars were of the similar view that allowing non-members into the library facilities will affect their study and research. They were of the opinion that their exist limited space facility in reading room, number PCs for online journal will be shared between them and others. So it should not be encouraged. However, their counterparts (28%) were of the view that since the basic purpose of library is to enhance the knowledge of people and it is the oldest and biggest library in the state, the facility extended to outsiders will enhance the image in public.

4. Majority (85%) of the public were of the opinion that it should be the social responsibility of the university library to provide at least reading facility and 15% of them viewed that both reading and borrowing books facility should be extended to them.

5. Out of 48 retired persons in the survey 46 (95.83%) of them strongly suggested that the university should amend its rules and regulations, and make them regular members with a deposit of Rs 5,000 to 10,000 and in exchange, all the library facilities should be provided to them. Interestingly, all (100%) of them were view that the library hours should be increased so that their boredom at home can be reduced and they can pass time well.

5. SUGGESTIONS
Based on the findings of the study and discussions with the stake holders, few suggestions are as follows:

i) University should be opened once a week for general public at a notified time so that it would be beneficial to them.

ii) Institutional membership should be provided to avoid individual responsibility with substantial fees so that they will be morally and psychologically be under pressure to utilize the facilities with proper care and concern.

iii) In book/ reading material selection, public opinion should be invited and accordingly based upon the membership (financial and quantitative) the library should procure reading materials for there benefit.

iv) University library should provide guidance and consultancy services to other libraries located in and around the state.

v) Online facilities should be increased to cater a bigger and scattered readership.

vi) More e-resources should be acquired and created in local language, so that 24*7 facilities can be provided without the threat of mutilation, theft, missing, etc.

vii) Staff of the library should be provided special training so that the stakeholders should be motivated to visit the library and avail its facilities.

6. CONCLUSION
Based upon the above findings and suggestions it can be concluded that it is high time for Pt Ravishankar Shukla University Library, to open up its boundaries in order to assess the expectations of various stakeholders of this educational system. Accordingly each players should play their respective role in terms of funding, infrastructure facilities and extend other essential support so that the oldest and the biggest university library of the state can fulfill its social responsibility, besides meeting its day to day responsibility towards the academic community of Pt Ravishankar Shukla University, Raipur.

REFERENCE
SWOT ANALYSIS OF THE PRIORITY TRAINING PROGRAMS: ITS IMPLICATION TO POLICY FORMULATION

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ABSTRACT

This study attempted to analyze the strengths, weaknesses, opportunities and threats of the priority training programs of the National Statistics Office (NSO)-Manila and looked into its implication to policy formulation. The study used a descriptive method of research using structured questionnaires administered to 539 respondents from the statistical and the non-statistical personnel who served as a respondents.

The objectives of this study was to identify the strengths, weaknesses, opportunities and threats of the top priority training programs conducted by the NSO in terms of its: program objectives, management, monitoring and evaluation, facilities, and budget. Result of this study offered suggestions on how to improve the training programs of the organization and served as basis in the formulation of the organization’s training policy.

Keywords: Strengths, weaknesses, opportunities, and threats of the priority training programs.

INTRODUCTION

The National Statistics Office (NSO) as the primary statistical arm of the government recognizes the value of the human resources. To the extent possible, the office strives to provide appropriate opportunities for personal and professional growth of the staff.

The NSO explores all possible avenues of employees growth not limited to attendance and participation in local in-house training programs but also in local and foreign training conducted by other local agencies and foreign donor countries with the end in view of promoting excellence in its product and services.

To realize the objectives of the office in providing personal and professional growth of its staff, the NSO conducted the Knowledge, Attitudes and Skills Need Assessment (KAS-Needs Assessment) in both central and field offices. Results of the KAS-Needs assessment became the basis of the three-year priority training and development programs. These priority training programs were implemented in 2003 to 2005.

Evaluating training programs is a management function by which it carries a systematic means of assessing the extent by which training and development programs have been carried out and program objectives have been attained. Since assessment in its strict sense covers the linked but separate process of validation and evaluation, it is necessary to ask whether training program designed and implemented have impact to the employees and helped them enhance their efficiency and effectiveness.

It is in this context that the researcher wants to identify the strengths, weaknesses, opportunities and threats of the priority training programs conducted by NSO and its implication to policy formulation.

In many countries, governments use training to address problems like low skill levels among the employed work force. However, as to whether public expenditures on training are warranted, it depends on the underlying cause of the problem and on the opportunity cost of public resources. Thus, World Bank (1995) argues that enterprise training is usually the most cost-effective means of developing worker skills. One leading example is Japan where all big Japanese firms have their own education and training colleges to train their employees.

Training is a noble and rewarding profession because it is dedicated to helping people grow. By developing people’s skills, increasing the knowledge or positively influencing their attitudes, trainers contribute to individual self-esteem and collective effectiveness of the employees. In order to maintain the integrity of their profession - trainers need to high standards of ethics and conduct. These standards have been developed as an easy-to-use checklist to measure professionalism. They can be used as a performance appraisal aid, self evaluation tool and checklist for each training program.

According to Raymon (2000), training program should be evaluated to identify the program’s strengths and weaknesses. This includes determining if the program is meeting the learning objectives, the quality of learning environment, and if transfer of training to the job is occurring. This is also the way to assess whether the content, organization, and administration of the program including the schedule, accommodations, trainer, and materials contribute to learning and the use of training content on the job.
SWOT analysis is a catchy term for basic common sense. Its potential usefulness depends on how accurate and intelligent the analysis is. Its actual usefulness depends on what is done as a result of the analysis. Ultimately it derives from the investigation of a wide range of factors that include, among other things, labour output, distribution, sales, the size of the market, and so on.

A system approach to training and development points the need for many of the things which make for successful training and development programs such as the following: relating training to on-the-job performance, careful specification of objectives, modifying training on the basis of results, designing training to fit the people concerned. It shifts attention away from the contents and methods of training courses, and focuses it on the objectives and achievements of training processes.

Training and development are programs, activities, and experiences which contribute to the personal growth of the person and to an improvement on the activities to carry out principal tasks. These encompass the inclusion of needed knowledge, skills, and proper attitudes and habits. Knowledge refers to the thorough understanding of the organization, its objectives, services and the job.

Andres further detailed the direction of a training program to the: 1) preparation of staff for specific new job assignment, and 2) expanding working perspective, inter-functional understanding and business outlook. Also, he spelled out the major bases for actual training activities which must be: 1) well-defined goal and objectives to be achieved and 2) training needs of staff identified for training and development. Total evaluation of training involves all levels. There are five levels of training effects which are also the five levels of objective setting and evaluation: reaction, learning, job behavior, organizational and ultimate value.

Cai (1998) in his study Situation Analysis and Training Needs Assessment of Natural Resource Management Stakeholders in the Mekong Delta revealed that a SWOT analysis was performed to help understand the impact of the interventions made by the university on rural communities. He concluded that human resources were listed as the main constraint and the mechanism of monitoring and evaluating activities was uncertain.

In 1997, Lipio studied the “Evaluation of the Training Programs of the Department of Agrarian Reform (DAR) in Region IV and its Implication to the Educational, Social and Economic Condition of Farmer Beneficiaries in Region IV”. He concluded that the impact of training programs of the DAR in Region IV on the four major components has a short term benefits for both the farmer beneficiaries and the DAR personnel. He even suggested that that for the improvement of the training programs of the DAR, there should be provision of market tie-ups for livelihood projects, training hand-outs, and involvement of DAR personnel field personnel to training needs assessment. He also concluded that the assessed components of the DAR training program that are informative and effective include attainment of program objectives, program context, program resources, program design, program approaches but not on evaluation of activities and monitoring activities.

It is in this context that the researcher wanted to identify the strengths, weaknesses, opportunities and threats of the priority training programs conducted by NSO and its implication to policy formulation.

STATEMENT OF THE PROBLEM

This study attempted to analyze the strengths, weaknesses, opportunities and threats of the priority training programs of the National Statistics Office (NSO)-Manila and looked into its implication to policy formulation.

Specifically, the study answered the following questions:

1. What are the strengths, weaknesses, opportunities and threats of the priority training programs of NSO in terms of the following:
   1.1 Program Objectives
   1.2 Program Management
   1.3 Program Monitoring and Evaluation
   1.4 Program Facilities and Materials
   1.5 Program Budgetary Resources

OBJECTIVE OF THE STUDY

The study aimed to identify the strengths, weaknesses, opportunities and threats of the top priority training programs conducted by the NSO in terms of its: program objectives, management, monitoring and evaluation, facilities, and budget as basis in the formulation of the organization’s training policy.
SCOPE AND LIMITATION

This study focused on the strengths, weaknesses, opportunities, and threats (SWOT) of the NSO’s in-house training and development programs conducted and implemented in the years 2003 to 2005 its attainment of program objectives, program management, program monitoring and evaluation, program facilities and materials, and program budgetary resources.

THEORETICAL FRAMEWORK

This study is based on the theory Killian that training, development and scholarship programs as a form of human resource development is highly essential for every organization since the quality of its personnel is a firm’s greatest asset. Hence, an organization’s human resources deserve only the best programs and benefits. This will prove to be mutually beneficial to all parties concerned in terms of additional knowledge and skills on the part of the employees and more inputs/production for the office.

This study is also anchored on Donald Kirkpatrick training evaluation model. According to Kirkpatrick, the four levels of evaluation models essentially measure: a) reaction of participants- what they felt and thought about training; b) learning – the resulting increase in knowledge of capability; c) behavior- extent of behavior and capability improvement and implementation/application; and d) result- the effects on the environment resulting from the trainees’ performance.

CONCEPTUAL FRAMEWORK

In the light of the theories mentioned, the researcher motivated to develop a system approach- INPUT-PROCESS-OUTPUT model that guided him in the development of this study. Figure 1 shows the research paradigm in the conduct of this study is shown on the next.

**Figure 1: Research Paradigm in the Conduct of the Study**

RESEARCH METHOD USED

The descriptive method of research using the normative survey analysis was used in this study to assess the strengths, weaknesses, opportunities, and threats of the in- house training and development programs conducted by the NSO. Documentary analysis was also used to gather data available in the office. The gathered data was subject to statistical treatment as it was necessary to draw information needed to answer the specific questions of the study.

RESPONDENTS OF THE STUDY

The respondents of this study were NSO employees who attended in- house training and development programs in CY 2003- 2005. They were composed of two groups: 1) Statistical Personnel, those whose positions are...
Ruel F. Ancheta

Statistician V and below; and 2) Non- statistical Personnel, those whose positions are either IT’s, HR’s, AO’s, Registration Officers, Information Officers, and Clerks.

**POPULATION AND SAMPLING FRAME**

The purposive sampling technique was used in this study. Since the purpose of the study is to assess the implementation of the in-house training programs at NSO, the sampling procedure used was limited by the purpose of the study. Of the 1,078 total employees who attended the in-house training programs, 50 percent (539) were considered respondents. They were selected using the simple random sampling.

**RESEARCH INSTRUMENT**

A questionnaire-checklist as a tool for gathering data was used. This questionnaire was very useful in gathering information and responses to specific questions in this investigation. The questionnaire used consisted of three parts:

Part I - asked for a demographic profile of the respondents.

Part II – dealt with questions pertaining to the assessment of the respondents on the extent of implementation of the training programs they had attended.

Part III- asked for the impact of the training programs on the trainee and the problems encountered in the implementation of the in-house training and development programs.

**DATA GATHERING PROCEDURES**

Upon receiving the go-signal from the authorities to conduct the study, the researcher sent a letter request to the Office of the Administrator of NSO to administer a survey questionnaire. Another communication was sent to the chief of the Human Resource Management Division asking permission to generate list of employees who attended the in-house training programs for CY 2003-2005. The information given to the researcher became the basis for determining the sample of the study.

To facilitate the distribution and retrieval of questionnaires, the researcher asked the help and assistance of his friends in different departments of NSO. After the questionnaires have been retrieved, the data then were tallied and subjected to statistical analysis.

**STATISTICAL TREATMENT**

The following statistical tools were used for the interpretation of results according to sub-problems:

1. **Frequency.** It is the actual number of response to a specific question/item category in the survey instrument.

2. **Percentage.** This is a descriptive measurement used to show the relationship among magnitudes in the distribution of responses. The formula is:

   \[
   \% = \frac{f}{N} \times 100
   \]

   Where: \( f = \) frequency and \( N = \) Total no. of respondents

3. **Weighted Mean.** This was used to get the average frequency of responses in each weighted item.

   Formula:

   \[
   WM = \frac{(f_5X_5) + (f_4X_4) + (f_3X_3) + (f_2X_2) + (f_1X_1)}{N}
   \]

   Sets of criteria were formulated for the interpretation of the results of the data gathered in the evaluation on the acceptability of the training program. The liker Scale was used to evaluate results. The following equivalence was given:

   3.a Assessment on the strengths, weaknesses, opportunities, and threats of the in-house training program.

<table>
<thead>
<tr>
<th>Option</th>
<th>Equivalent Points</th>
<th>Verbal Interpretation</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
RESULTS AND DATA ANALYSIS

From the analysis of the data, the findings were as follows:

1. The following are the SWOT of the Training Programs as to program objective, program management, program evaluation and monitoring, program facilities and materials, and program resources.

<table>
<thead>
<tr>
<th>Items</th>
<th>Statistical (158)</th>
<th>Non-statistical (381)</th>
<th>Both (539)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WM</td>
<td>VI</td>
<td>WM</td>
</tr>
<tr>
<td>Program Objectives</td>
<td>4.26</td>
<td>A</td>
<td>4.29</td>
</tr>
<tr>
<td>Program Management</td>
<td>4.18</td>
<td>A</td>
<td>4.02</td>
</tr>
<tr>
<td>Program Evaluation</td>
<td>3.74</td>
<td>A</td>
<td>4.02</td>
</tr>
<tr>
<td>Facilities and Materials</td>
<td>4.41</td>
<td>A</td>
<td>4.17</td>
</tr>
<tr>
<td>Program Resources</td>
<td>4.13</td>
<td>A</td>
<td>4.11</td>
</tr>
<tr>
<td>OVERALL MEAN</td>
<td>4.14</td>
<td>A</td>
<td>4.12</td>
</tr>
</tbody>
</table>

It can be gleaned from the table that both respondents agreed that the training programs conducted by the NSO had met the following as to its program objectives, program management, program evaluation, facilities and materials, and program resources with an overall mean score of 4.13.

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Statistical (158)</th>
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<td></td>
<td>WM</td>
<td>VI</td>
<td>WM</td>
</tr>
<tr>
<td>1. Program Objectives</td>
<td>2.44</td>
<td>DA</td>
<td>2.34</td>
</tr>
<tr>
<td>2. Program Management</td>
<td>2.29</td>
<td>DA</td>
<td>2.03</td>
</tr>
<tr>
<td>4. Program Facilities and Materials</td>
<td>2.14</td>
<td>DA</td>
<td>1.73</td>
</tr>
<tr>
<td>5. Program Resources</td>
<td>3.12</td>
<td>D</td>
<td>3.13</td>
</tr>
<tr>
<td>OVERALL MEAN</td>
<td>2.67</td>
<td>D</td>
<td>2.52</td>
</tr>
</tbody>
</table>

The program objectives, program management, and program facilities were rated disagree by both statistical and the non-statistical respondents. However, program evaluation and monitoring and program resources were rated doubtful by both respondents.
Table 3 Summary of Assessment Between the Statistical and Non-Statistical in the Opportunities in Implementing Training Programs

<table>
<thead>
<tr>
<th>Items</th>
<th>Statistical (158)</th>
<th>Non-statistical (381)</th>
<th>Both (539)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WM</td>
<td>VI</td>
<td>WM</td>
</tr>
<tr>
<td>1. Program Objectives</td>
<td>4.18</td>
<td>A</td>
<td>4.28</td>
</tr>
<tr>
<td>2. Program Management</td>
<td>4.03</td>
<td>A</td>
<td>4.51</td>
</tr>
<tr>
<td>3. Evaluation and Monitoring</td>
<td>3.94</td>
<td>A</td>
<td>4.3</td>
</tr>
<tr>
<td>4. Facilities and Materials</td>
<td>3.79</td>
<td>A</td>
<td>3.87</td>
</tr>
<tr>
<td>5. Program Resources</td>
<td>3.89</td>
<td>A</td>
<td>4.26</td>
</tr>
<tr>
<td>OVERALL MEAN</td>
<td>3.97</td>
<td>A</td>
<td>4.24</td>
</tr>
</tbody>
</table>

Both respondents agreed that the opportunities in conducting training programs must be in the program management criterion. The respondents pointed out the use of state-of-the-art technology must be taken into consideration, utilization of outside resource speakers, and sufficient time allotment for each topic of at least 3 hours per module.

**TABLE 4 Summary of Assessment Between the Statistical and Non–Statistical on the Problems / Threats in the Implementation of the Training Programs**

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Statistical (158)</th>
<th>Non-statistical (381)</th>
<th>Both (539)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WM</td>
<td>VI</td>
<td>WM</td>
</tr>
<tr>
<td>Program Objectives</td>
<td>3.53</td>
<td>A</td>
<td>4.05</td>
</tr>
<tr>
<td>Program Management</td>
<td>3.26</td>
<td>D</td>
<td>3.98</td>
</tr>
<tr>
<td>Evaluation and Monitoring</td>
<td>3.97</td>
<td>A</td>
<td>3.61</td>
</tr>
<tr>
<td>Facilities and Materials</td>
<td>3.65</td>
<td>A</td>
<td>3.93</td>
</tr>
<tr>
<td>Program Resources</td>
<td>3.46</td>
<td>D</td>
<td>3.60</td>
</tr>
<tr>
<td>OVERALL MEAN</td>
<td>3.57</td>
<td>A</td>
<td>3.83</td>
</tr>
</tbody>
</table>

Table 23 showed that program objectives, program management, evaluation and monitoring, facilities and materials, and program resources were agreed to the statistical and non statistical as evidence by the overall weighted mean scores of 3.86, 4.14, 3.52 and 3.64 respectively, with the over all weighted mean of 3.79.

The respondents indicated that they are all agreed that there are threats and problems in the implementation of training programs as indicated in the overall mean of 3.79 particularly in the program objectives, evaluation and monitoring, and facilities and materials. Disinterest of the trainees is a problem, and the trainers attention which hampered by their duties and responsibilities apart from their assignment as trainer in particular topic. Also another problem in the conduct of the training is that the difficulty of training specialist to conduct follow up interview after attending training and the chief of the trainees are not cooperative.

**CONCLUSIONS**

From the findings of the study, the following conclusions are drawn:

1. The components of the priority training programs of the National Statistics Office were implemented but not to the fullest extent.

2. Opportunities like: accurate diagnostic of the training needs of the participants, and accurate identification of training content, and giving of authentic examples were identified for the improvements of the training programs.

3. A policy is formulated based on the findings of the study with the end in view of an effective and efficient implementation of the training and development practices of the National Statistics Office.
RECOMMENDATIONS
From the findings and conclusions, the following recommendations are made:

1. The proposed training policy of the NSO be implemented immediately to all stakeholders through issuance of a memorandum from the Administrator of the NSO.

2. Monitoring and evaluation of the training conducted be periodically done to assess the suitability and feasibility of the training policy.

3. Training Officers should develop training modules suited to the needs of statistical and the non-statistical employees.

4. Conduct training needs assessment (TNA) every after three (3) years as basis for the conduct and implementation of the in-house training programs.

5. Proper selection of lecturers/trainers, probably invited speakers, be provided to enhance greater learning.

6. Further similar in-depth study may be undertaken by training officers on the aspects not covered by this study.

7. The results of this study be used to develop appropriate policy(s) effecting the NSO in-house training programs to enhance efficiency and effectiveness.

REFERENCES
Books


Reports


DEVELOPMENT OF POST RESULT MOBILE APPLICATION USING SOA FOR SQU STUDENTS

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ABSTRACT
In the modern age of information and communication technologies in work and social life, people increasingly use computers and computer applications. It should be pointed out that mobile applications usage and development have been growing. Today, there are several mobile applications, which have been progressed in order to increase the facilities and services for people. It is worth that a higher education environment is one of these sectors, which requires new services and technologies to be implemented. Beside that, the critical scheme of these services is to make the work more extensible, satisfy student’s need, ensure the accuracy of data, achieve fast access to information and save time. The goal of this paper is to develop post result mobile application for students at Sultan Qaboos University (SQU) which is considered as one of the major services for higher education institution. This paper claims that the post result mobile application is the first and unique service, which is provided for SQU students in order to allow them to send their appeal against their exams results via fast and user friendly application. Since mobile applications use Service-Oriented Architecture to implement their application services, this research paper is also intended to investigate the possibility of developing post result mobile application for SQU students based on Service-Oriented Architecture (SOA)

Keywords: Mobile Application, Service-Oriented Architecture (SOA), Post Result Mobile Application, Mobile Host, JSON, Xml, Service.

1. INTRODUCTION
Mobile applications are software and programs that run on a mobile device and execute multiple tasks for the users. Mobile application development is original and fast rising fragment. Mobile applications are running on handheld mobile devices or smartphones, which are portable, easy to use and available to access from anywhere and at any time. Today, many people are using mobile applications to search and browse internet, communicate with friends, follow news, play games…etc. By using mobile applications, users can quickly communicate with others, save time, increase productivity and improve IT infrastructure in developing countries. SOA is a framework for combining distinct resources or applications. SOA allows various applications written in different languages to be accessed and recovered by a single compound application, such as a portal or forum. SOA does not only benefit the business sectors and IT infrastructures but also grips several challenges that need to be solved in future improvement. This paper focuses on evolving a post result mobile application for SQU students based on SOA. It is supposed to improve education services quality. In particular, it searches SOA and its relationship to the more well-known concept of software components for post result mobile application. It describes how the new proposed tool could improve the appeal process. Also, this paper illustrates, the implementation of service architectures using SOA. This will be an informative description in which the collection of relevant data from different resources and the analysis of these materials will guide the researchers to have a comprehensive appreciation of the SOA environment for the mobile application. It will deepen the understanding on how to implement SOA to upgrade the quality of proposed tool. In this paper, development of post result mobile application for SQU student using SOA will take different perspectives such as: design an architecture for post result mobile application. Section 2 presents some related works. Section 3 introduces an overview about mobile application development and service oriented architecture. Section 4 presents a case study on SQU post result mobile application using SOA. Section 5 provides conclusions and future work.

2. RELATED WORK
The domain of mobile applications remains to be one of the most rapidly expanding areas of communications. Many mobile applications are implemented using Service-Oriented Architecture. Therefore, the objective of this paper was to develop the post result mobile application using SOA for SQU students. The literature has been investigated to have a clear lightweight about any existing SOA- based architecture for post result mobile application. (Brown et al., 2002) provided in details the understanding of Service-Oriented Architectures for enterprise software development. The authors demarcated the concepts of component-based development, which was recognized in technical methods for instance Microsoft .NET platform, and Java 2 Enterprise Advanced Software System Development Edition (J2EE). (Van Thanh and Jørstad, 2005) in there paper checked
how the constructing of services in mobile application can take profit from the service-oriented model. Furthermore, they talked about the support of mobile services in SOA. The paper discussed the equivalence of service components. Consequently, (Kinshuk and Chen, 2005) illustrated a sample for a mobile system that could be used in educational services. The prototype had presented that the mobile in education service can be beneficial to the existing desktop systems. In addition to that, both learners and teachers might gain from the mobile education services for suitable and direct access to resources. (Shahriz et al., 2006) tried to demonstrate in their studies that the usage of mobile services in the educational environment, explored the nature of mobile phone services use between university students, and studied the insight of university students on mobile phone uses in an information and library facilities. Therefore, the high percentage of the respondents specified that there was an increasing need of mobile application and m-services in different sectors including health, education and business sector. (Natchetoi et al., 2008) found that, there were more than 3.3 billion linked mobile devices in the world, and this number was growing day-to-day. Mobile phones are fetching a new prevalent platform for business applications. Because of their huge acceptance and flexibleness, mobile phones come to be supplied with hardware and software equipment such as Bluetooth, digital cameras, and other software with a highly reduced cost. Regarding the security in mobile application, (Wasserman, 2010) determined topics associated with mobile development depending on development procedures, tools, user interface, application movability and security. Also, (Sen, 2010) defined SOA as a structure that allows application performance to be offered just like sets of services published to the service consumer. Moreover, (Dehlinger and Dixon, 2011) classified four main challenges in mobile application in the field of software engineering. These challenges mainly occur when generating universal user interfaces, when allowing software reuse through mobile platforms and when designing context-aware mobile application. Since, there was a necessity to practice adornment of development allowing developers to generate and provide services to students to be more quick and efficient, SOA for mobile application had emerged as a solution. Therefore, (Genevra et al., 2014) presented SOA as a software design and software architecture design form based on separate portions of software offering application functionality for instance services to other applications. The paper presented a Microsoft hierarchical quality assessment model for early evaluation of SOA system quality. Also, (Lin et al., 2014) argued that, as mobile applications grew, they believed that mobile application security would continue to be a rich research area. In order to implement these mobile applications, the developers demand to merge SOA with secure components. (Bokhari et al., 2015) gave an overview of cloud computing and SOA. Moreover, the authors suggested a solution to one of the restrictions of SOA. They used the XML layout for message passing which consumed additional bandwidth of the network. They intended to perform this solution to SOA web based architecture as their coming work in future. Also, (Al-Khanjari et al., 2015) presented an extension tool to support students in Sultan Qaboos University to send their appeal against exams results via a mobile application. The proposed approach used SOA to provide flexible functionalities for the system.

3. MOBILE APPLICATION DEVELOPMENT AND SERVICE ORIENTED ARCHITECTURE

In essence, Service-Oriented Architecture (SOA) is an important design standard for mobile application that needs suitable software platforms for the transfer, support, implement and maintaining of distributed applications. Beside that, it describes the services of which the system consists of and defines the connections that transpire between the services to recognize certain behavior to these services. Furthermore, (Al-Khanjari et al., 2014) mentioned that SOA characterizes functionality of applications in software as services with the aim of launching native interoperability within services. Therefore, (Seppanen, 2008) clarified that SOA services are self-sufficient and abstracted to be coarse-grained. As a result, to achieve scalability and reusability for developing post result mobile application to SQU students, Service Oriented Architecture is considered as the best model architecture.

3.1 SERVICE ORIENTED ARCHITECTURE MODEL

There are different aspects a developer needs to take into account when diagnosing scheme applicable for the mobile app. For instance designing and implementing mobile applications that will assist educational sector. Consequently, there is a necessity to use a form of development that permits developers to produce and provide their services speedily and efficiently. Service-Oriented Architecture (SOA) is determined as answer to this type of necessity. SOA has seen rapid growth in enterprise systems and currently used architecture. It fundamentally changes the way of developing and deploying software projects. In addition, SOA allows the combination of current functions with new development efforts and letting the construction of composite applications. SOA is a category of services. These services are connected with each other. Likewise, (Houlding, 2004) illustrates that in SOAs, services are applicable using interface description language and protocol, commonly Web Services Description Language (WSDL) and Simple Object Access Protocol (SOAP).

- Service Requestor (Client) – requests mobile service.
- Service Provider (Service) – progress mobile service request.
- Service Registry - location of service description.
Figure 1. Service-Oriented Architecture

Figure 1 above illustrates three main basic components of SOA: There are numerous advantages of using SOA to implement or extend the services. These advantages are as following (Chang and Hsiao, 2011):

- The reusability of the service can be reached by reusing any legacy system services or new services.
- The collaboration between heterogeneous components and extensibility for the system functionality can be achieved better by using SOA.
- Easy of the integration and the implementation are fully transparent.
- It is loose coupling which helps to build stronger application.
- The interoperability between integrated platforms and facilitated.
- Implementation and location transparency of the services.
- Conflicting of data formats produced by variant development platforms and avoided.

4. CASE STUDY: SQU POST RESULT MOBILE APPLICATION USING SOA

In this section, the developers give an overview on how to develop the post result mobile application using SOA for SQU students. This system will serve education sector since there is no such tool using SOA nor were services available in the literature. In addition to that, this application offers appeal service, which is a new service that can be accessed using android devices. Students can send their appeal request during the appeal duration and wait for the results. This feature provides appeal results that enable the students to check the appeal results. The post result mobile application consists of two services, which are: appeal services and appeal results. It uses the concept of SOA in terms of applying the services in remote access server and receives the students’ data. The application requires the students to use their university id and password in order to access the application. The application is not a replacement for any existing application, rather it is a new application.

Figure 2. Sending request by mobile’s user to the services provider

Figure 2 shows the request sent by students who use the post result mobile application through their mobiles to the services provider where the services linkes are stored. The provider publishes a list of data links to the main database, which is the register services. These links include a list of data needed by users. The service register will store these links to be available for the mobile’s users (students). As a result, the mobile users will bind themselves to these links via the provider.
4.1 BENEFITS OF POST RESULT MOBILE APPLICATION

Post result mobile application is chosen for the following benefits:

1. The development of the post result mobile application will provide student’s essential, easy and secure tool to access their university services. Moreover, these services will improve facilities that allow students at SQU to deal with university online services with a new online service where they can appeal against final exam result.

2. Applying the concept of SOA in post result mobile application will give influence of new software tools for SQU students.

3. The benefits of such a case study will help the researchers to gain more knowledge and skills. Moreover, it will deepen understanding on how to implement SOA to improve the quality of a project.

4. Provides a supporting extensions tool to E-Government.

4.2 POST RESULT MOBILE APPLICATION FRAMEWORK USING SOA

Figure 3. A framework of services for Post Result Mobile Application for SQU Students

Figure 3 above describes the framework of post result mobile application for SQU students. The figure illustrates the services that are provided to students including appeal forms and appeal result as appeal operation module. These services can use the database (tables) which store all students’ related data. Once the student has the right to access, the application then he/she will be able to use the other services. Appeal services provide students with different privileges for instance access appeal service, check appeal time, send appeal request, save appeal request and send appeal remarks via email. On the contrary, student could view appeal result list as a result of his/her appeal request.

Figure 4. Manage Post Result Mobile Application
Figure 4 provides further details about services, which are supposed to be used the post result mobile application. As the main services structure, the developers followed the same steps to upload the services and receive the data from the remote server. All the system services will be uploaded as JSON pages and get the URL to be used in the application. The JSON provides the data as XML. Glossary of Terms (n.d.) defined JSON (JavaScript Object Notation) is a lightweight data-interchange design. It is created on a batch of the JavaScript Programming Language and notify the client with precise data. Based on the above framework, researchers can apply SOA to be used for building new post result mobile application using services provided by service providers. These services will be in the form of JSON data received from remote server. So, the new system will be composed of independent services supplied by the provider.

Therefore, the requirement for developing new service:

- Server: create services and issue them for public purpose.
- Client: access for requesting a desired service required to build a system.
- Services: are implemented functionalities that will be created by a server.
- Database: store services those are created by a server and used by client.

5. CONCLUSION AND FUTURE WORK

In this paper, we have presented post result mobile application for SQU students, which is a flexible and an easy-to-use application. In order to help SQU students to access the appeal service easily with a fast response time, students are encouraged to use this service using new technologies such as mobile phones. The developers followed a set of steps to come up with the analysis and design phase in a complete manner. For instance, specified the functional and non-functional requirements of the system and designed the framework/architecture for the app with SOA services. Because, applying the concept of SOA in post result mobile application will give power to implement this application in real environment. In future, we intend to distribute the admin services in internal repository to be available on the same mobile app. Moreover, these services will contain update appeal request, delete appeal request and other additional facilities. In addition, the researchers will expand the idea to cover other mobile platforms for instance, IOS platform.

6. REFERENCES


Waljat College of Applied Sciences (WCAS) was founded by H.E. Dr. Omar Bin Abdul Muniem Al Zawawi in 2001 with an aim to promote high international quality education in Oman that prepares students for modern high quality jobs. The WCAS campus is located in Knowledge Oasis Muscat, Rusayl with state-of-the art teaching facilities, laboratories, library and student amenities and it functions in academic partnership with Birla Institute of Technology (BIT), a reputed deemed university located in Mesra, Ranchi, India. BIT was founded by the philanthropist and industrialist, the Late Mr. B.M. Birla in 1955 and since then has been a pioneering institution in the fields of technical education and research.

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