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IMPACT OF CLOUD COMPUTING IN SUPPLY CHAIN MANAGEMENT

Kavitha Venkatachari[1] Siva Sankar Katari[2]

ABSTRACT

At present companies are searching ways to optimize cost and operational efficiency of supply chain such as planning and forecasting, sourcing and procurement, logistics and service and spare parts management. Supply Chain Management (SCM) can be defined as the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally".

The developments in technologies enable the organization to avail information easily and are helpful to manage the supply chain. Supply chain management is the management of supply chain activities to maximize customer value and achieve a competitive advantage. It represents a conscious effort by the supply chain firms to develop, run supply chains in the most effective & efficient ways possible.

KEYWORDS

SCM (Supply Chain Management), Cloud Computing, Optimization etc.

CLOUD COMPUTING TECHNOLOGY

Cloud computing, a new technology used for optimization by providing infrastructure, platform and software solutions for the whole supply chain via internet. The cloud-based services are used in supply chain management, which lead to financial and operational benefits. Lower cost in contrast to on-premises infrastructure cost, supply chain visibility, platform scalability and flexibility through supply chain partners' collaboration are some notable examples.

Cloud computing is defined as "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 resources based on service-level agreements established through negotiation between the service provider and consumers."

Cloud consists of several elements such as clients, data center and distributed servers, which also include fault tolerance, high availability, scalability, flexibility, reduced overhead for users, reduced cost of ownership, on demand services etc.

ADVANTAGE OF CLOUD COMPUTING IN SCM

Main advantage of cloud-based systems is visibility, which provides timely connectivity among multiple supply chain participants. Therefore, visibility is a key issue for SCM as it is not only helping companies to coordinate their operations, manage many different customers but also allows the customer network to have a transparent view of the entire system.

Cloud-based systems are able to provide real time visibility of inventory and shipments and improve logistics tracking. By using cloud computing, companies can control their system capacity more accurately. In periods where demand is high, companies need enough capacity in order to be able to face this increasing demand. Consequently using common on-premises systems, they should own the necessary database for the whole year in order to respond to the demand for a short period. However, with the introduction of cloud technology, companies where given the opportunity to adjust their capacity automatically according to their needs and scale their computing power depending on demand fluctuations.

In cloud computing storage and resources are managed centrally. In logistics management of SCM, where no of distribution centers scattered over different regions. The centralized system keeps track on delivery information as well as services using a centralize data center. There is probability of network congestion and this problem depends because of load on datacenter. So various load-balancing techniques are required. There will also chances to increment in latencies due to higher demand of any particular service.

SIGNIFICANCE OF CLOUD COMPUTING IN SUPPLY CHAIN MANAGEMENT

In cloud computing, the applications of supply chain are innovative and generate a new field of research. Two or more parties linked by cloud services in cloud supply chain to provision of cloud services, related information and funds.

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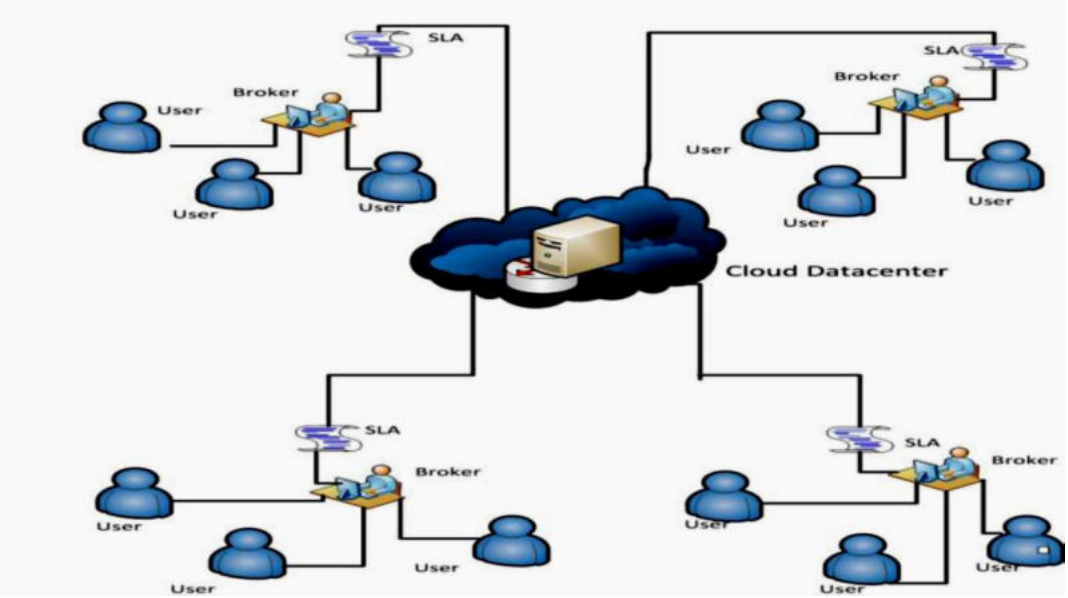
Figure-1: Architecture of Centralize Cloud Datacenter for SCM



Sources: Authors Compilation

A. Forecasting and planning

Cloud-based platforms are going to help companies improve their service levels by collaborating the chain's partners (retailers, suppliers and distributors) that are playing a major role in demand forecasting. These clouds based platforms get the data from internet, perform basic operation like analytics, and perform more accurate demand forecast for all supply chain partners. This will help to aware the chain collaborates to if there is volatile of real demand, they can handle it with easily.

B. Source and Procurement

Sourcing includes acquisition, receipt and inspection of incoming materials as well as procurement process. Cloud based platform operate on database contains multiple data from different suppliers which provide efficient and different benefit for companies that handle thousands of them. On the other hand, companies are able to select between supplier that which of them are able to provide appropriate martial as their specification and within time. Cloud based tools also enable companies and suppliers to mutually develop contracts and enhance contract management.

C. Inventory Management Using Wireless Devices

Inventory management enhanced by many organization using bar coding technologies and wireless services. RFID system integrates with the cloud based centralized data management sys-tem to deliver the global identification and tracking of any items or goods across the global supply chain management lifecycle.

D. Collaborative Design and Product Development

Along with the development of information technology, internet network transmission technology is mature gradually, its security, stability, compatibility is constantly improved, and all application range is expanding continually, become a kind of the making universal of transmission. Collaborative product development includes the use of product design and development techniques across multiple branches of same organization or between different organizations. All the developments process shared over secure network between different organizations. These processes include specific information, marketing firm, test result and design changes as well as customer feedback.

E. Logistics Management

Logistics involve process of material acquisition, warehousing and transportation process. Logistics information management system keep track on inventory information. By using logistic management under cloud gives fallowing benefits:

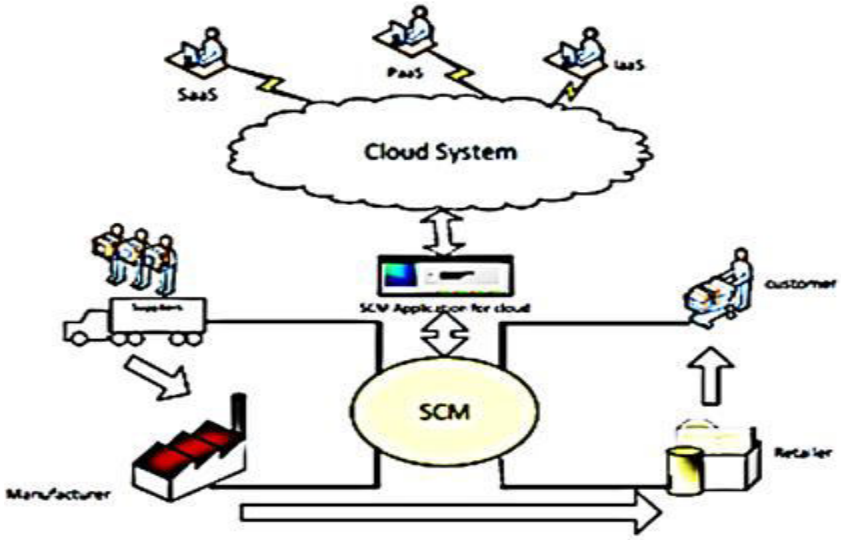
1) On Demand Self-Service

Consumers parallel request and use computing capabilities without any human interaction with their service provider. Here internet access allows users to consume computing capabilities by means of client's platforms like mobile phones, notebooks or PCs.

2) Resource Pooling

In order to fulfill the consumers demand from multiple consumers, the cloud computing service providers pooled their resources. The provider dynamically assigns or reassigns physical or virtual resources to consumers. Consumers on the other hand have no knowledge about the resource location, which is assigned to consumers.

Figure-2: SCM Architecture in Cloud



Sources: Authors Compilation

3) Elasticity

In cloud computing it is the ability of providers to quickly add and release the resources as soon as possible to match changes in consumers demand. This should be done in efficient manner.

4) Scalability

Scalability means that a system "maintains its performance goals/SLAs even when its workload increases (up to a certain workload bound)", whereas, an elastic system dynamically adds or release more resources when service demand increase or decreases respectively. Therefore, elasticity adds dynamic component to scalability.

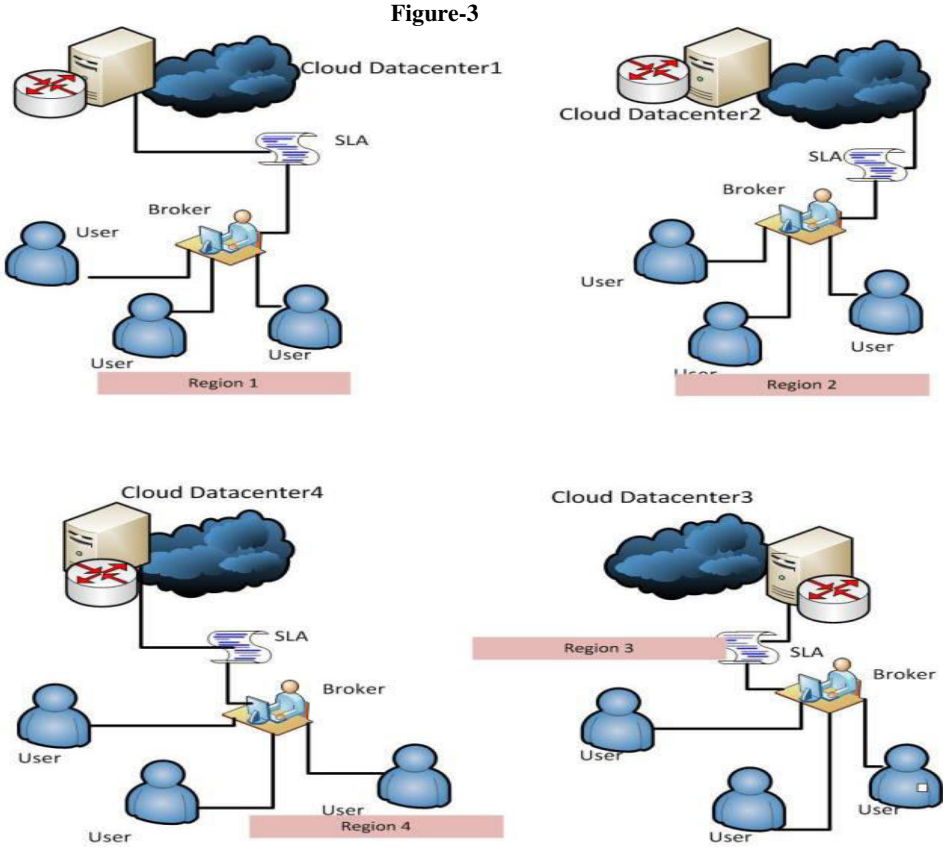
IMPACT OF CLOUD COMPUTING

Cloud computing system uses lot of technology like standardization technology, virtualization technology, data management technology and platform management technology in supply chain information collaboration. Flexibility is great power of cloud computing system. It has the ability to increase or decrease computing power as required by users. This term is referred as scalability. Scalability ensures that computing services available to the users at any point in time. Scalability is highly concern issue in supply chain management system. Because supply chain is distributed in nature and each firm wants to grow its supply and distribution, there should be need to scale IT services of supply chain at big level. Distributed datacenter provide better bandwidth and traffic for supply chain users in cloud.

Cloud provide on demand services by which a supply chain user use when required. The firm or company, which is using supply chain, has different branches in different geographical regions like Asia, Europe and North America. If the supply chain of any firm distributed globally then it requires a distinct infrastructure of cloud for each of its branches. Information sharing must be reliable and secure between different supply chain users so there is need of its own private cloud system. In private cloud

information, sharing has done reliable and secure way. Therefore, besides using a centralized Cloud data center, a company or firm should use distributed data center under private cloud circumstances. Using distributed data center under private cloud has fallowing benefits over centralized one.

Figure-3



Sources: Authors Compilation

A. Efficiency

Centralized system takes request from users globally, which create more loads on servers. Therefore, there will be chance of increment in latency. This will create time delay between request and response. On the other hand, local datacenter under distributed cloud environment gives more fast response to their users.

B. Scalability

A system would scalable if cloud gives least amount of latencies during information sharing and collaboration between two or more users.

C. Security

In private cloud, the firm creates its security policy according to their own requirement**.** If it is distributed then policy has great effect due to their regional information sharing policy. A single supply chain company can use different security policy for different users in different regions.

CONCLUSION

Supply chain firms are initially start-using cloud computing for their services and using cloud services supply chain efficiently utilized. The various architecture of cloud is available and need to explore fully utilized and scalable cloud infrastructure. In this paper we presented how supply chain can adopt the basic idea of cloud computing for its IT services and also presented an architecture of distributed cloud datacenter instead of centralize cloud datacenter which gives more efficient and scalable infrastructure for supply chain users and partners which reside in different regions.

Above architecture will best suit for where information tracing or sharing are highly used like forecasting and logistics management of supply chain. Therefore, companies who are willing to improve their services of information collaboration and want to scale their services at large level can use distributed cloud datacenter.

REFERENCES

1. Leukel, Joerg, Kirn, Stefan, & Schlegel, Thomas. (2011, March). Supply chain as a service: A cloud perspective on supply chain systems. ***IEEE Systems Journal,*** 5(1), 16-27.

2. Armbrust, M., Fox, A., Griffith, R. Joseph, A. D., Katz, R., Konwinski, A…..Zaharia, M. (2009, February). ***Above The Clouds: A Berkeley View of Cloud Computing*** (Technical Report), pp. 1-23. Berkeley. University of California: EECS Department.

3. Lucky, R. W. (2009, May). Cloud computing. ***IEEE Journal of Spectrum,*** 46(5), 27-45.

4. Dikaiakos, M. D., Pallis, G., Katsa, D., Mehra, P., & Vakali, A. (2009, September/October). Cloud computing: Distributed internet computing for it and scientific research. ***IEEE Journal of Internet Computing***, 13(5), 10-13.

5. Kumar, Buyya Raj, Yeo, Shin Chee, & Venugopal, Srikumar. (2008). Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering IT Services as Computing Utilities. ***In Proceedings of the 10th IEEE International Conference on High Performance Computing and Communications***. HPCC, IEEE CS Press, Los Alamitos, CA, USA

6. Liu, Shuangqin, & Wo, Bo. (2010, May 07-09). Study on the supply chain management of global companies. ***In Proceedings of the International conference of E-business and E-Government*** (pp. 3297-3301). Guangzhou: People's Republic of China.

7. Supriya, B. Andal, & Djearamane, Ilango. (2013, May). RFID based Cloud Supply Chain Management. ***International Journal of Scientific & Engineering Research***, 4(5), 2157-2159.

8. Jun, Chen, & Wei, Ma Yan. (2011). The research of supply chain information collaboration based on cloud computing. ***Procedia Environmental Sciences,*** 10, 875–880.

9. Bowersox, D. J., & Closs, D. J. (1996). ***Logical Management: The Integrated Supply Chain Process***. U.S.A. New York: McGraw-Hill Companies.

10. Schramm, Thomas, Wright, Jonathan, Seng, Dirk, & Jones, Derk. ***Six questions every supply chain executive should ask about Cloud Computing,*** ACC10-2460/11-241. Retrieved from http://www.accenture.com/.../10-2460-Supply_Chain_Cloud_PoV_vfinal.pdf

11. Retrieved from http://www.ijitee.org/attachments/File/v3i5/E1286103513.pdf

12. Retrieved from http://blog.effiasoft.com/author/Venkat

13. Retrieved from http://essplblog.wordpress.com/tag/cloud-computing/

14. Retrieved from http://ijarcsse.com/docs/papers/Volume_4/2_February2014/V4I2-0383.pdf

15. Retrieved from http://cloudtweaks.com/2014/10/overcoming-obstacles-cloud-computing-adoption-2

16. Retrieved from http://cmuscm.blogspot.co.uk/2014/09/supply-chain-management-and-cloud.html

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A CRITICAL STUDY OF CASE TOOLS AND THEIR IMPACT ON SOFTWARE DEVELOPMENT LIFE CYCLE (SDLC) WITH RESPECT TO INFORMATION TECHNOLOGY INDUSTRIES

Dr. Manisha A. Kumbhar[3] Dr. Vilas D. Nandavadekar[4] Sagar G. Talreja[5] Chetan A. Wagh[6]

ABSTRACT

CASE (Computer Aided Software Engineering) tools have played a critical role in improving software productivity and quality by assisting tasks in software development processes. Several parametric software cost models adopt "use of software tools" as one of the environmental factors that affect software development productivity, reduce time period required for implementation of software and development cost. Most software development teams use CASE tools that are assembled over time and adopt new tools without establishing formal evaluation criteria.

Many CASE Tools are available in the market which deals with the particular one phase or with the combined phases of SDLC (Software Development Life Cycle) for reducing the Effort and development time of the implementation of the software. This research mainly focuses on to find out the most popular tool for individual or combined phase of software development life cycle and its impact on Human Resource in IT industries in Pune City. This research is also evaluates the pros and cons of CASE Tools with various factors like user friendliness, customization, training, time, cost etc.

KEYWORDS

CASE Tool, SDLC, IT etc.

INTRODUCTION

CASE Tool is currently one of the most important aspects of SDLC in IT industries which can be used in any phase of SDLC like in Analysis, Designing, Coding, Testing and Maintenance to helps employees for reduce their workload. From last three decades, the use of CASE Tools has been increased anonymously and the functionalities provided by the CASE Tools are increasing day by day. In previous versions of CASE Tools the CASE Tools were developed for individual phases of SDLC but nowadays the CASE Tools are made for more than one phases and they automate all the phases of SDLC.

NEED AND SIGNIFICANCE

Due to Time constraint, Employees in IT industries have to complete their task in time to achieve a deadline and sometimes they have to work in shift also. Plenty of CASE Tools which available in market to make the work of employees in more easy way. CASE Tool generates the automatic coding, designing, analysis; testing due to this many features; time and cost of Project are reduced. However, many more employees do not know the popular CASE Tools for particular individual phase or for combined phase. In addition, the impact of CASE Tools on IT industry is more important to calculate and to generate desired conclusion so that the employees or industries can use the proper supporting CASE Tools in their work. Impact of CASE Tools on Human Resource is also very important factor. In addition, researchers need to know that as per the working of CASE Tools there will be fewer requirements for employees in IT industry or not.

SCOPE OF SYSTEM

For study purpose researcher has considered IT industries from Pune sector only and it is mainly focus on study of usage of various CASE Tools, which are available in the market and their pros and cons with respect to the SDLC.

RESEARCH DESIGN & METHODOLOGY

Survey based research methodology has been used to carry out research. The study is related to the use of CASE Tools and its Impact in IT industry. In addition, it focuses on Pros and Cons of use of CASE Tools in IT industry with respect to time and money to reduce development cost. To achieve the objectives of the study, primary data has been collected by using Convenience sampling method from Employees of IT sector that uses CASE Tools in various phases of SDLC.

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OBJECTIVES OF RESEARCH

- To do the phase wise comparative study about various CASE Tools available for software development.
- To identify the impact of CASE tools on human resource in IT industries.
- To identify pros and cons of CASE Tools with respect to development time and cost.

RESEARCH HYPOTHESIS

- H_1: Use of CASE Tools in SDLC reduces human resource.
- H_2: CASE Tools reduces software development Cost and Time.

METHODOLOGY OF RESEARCH

A sample design is a definite plan for obtaining a sample from a given population, which refers the procedure to select items for the sample. Sample design may as well lay down the number of items to be included in the sample i.e.; the size of the sample.

Sampling Method: We have collected data from 45 employees from IT industries from Pune sector who actually work on various phases of SDLC. Data has been collected through online questionnaire by using Google Docs.

- **Area Covered:** Pune.
- **Population of Interest:** Employees of IT industries who uses CASE Tools.
- **Sample Size:** 45
- **Sampling Method**: Convenience sampling.

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

This research is aimed to study the use of CASE Tools for various Software Development phases by employees of IT companies in Pune city and their pros and cons during the whole life cycle of software development. This research also aimed to determine whether CASE Tools have reduced the requirements of developers in IT industries or not.

CASE Tools used in SDLC

First objective of the study is "To do the phase wise comparative study about various CASE Tools available for software development", which mainly focus on study of various tools available in the market and use of those tools in software industry for implementation of Software in SDLC. For this objective, researcher has studied various CASE Tools used in IT industries with different phases of SDLC. Tools like Use, Meta, IBMUCM, DMS, CAGEN, Oracle, ArgoUWE, Visio2000, Visio2007, Artiso, DBMain, IGraph, RationalRose, ArgoUML, Visible, Turbo, SQLquery, CodeSmith etc. In addition, it considered various factors, which inspire employees to make use of CASE Tools for reducing Labor Work & Human Errors, to improve Performance & Accuracy in Less Time period. Following Table No.1 shows the use of CASE Tools in various phases of SDLC.

Table-1: Use of CASE Tools in Phases

CASE Tools/ Phases	Analysis	Design	Coding	Testing	Implementation	Maintenance	Not Used
Meta CASE Tool	4(8.89)	11(24.44)	0	2(4.44)	0	0	28(62.22)
IBM UCM (Unified Change Management)	1(2.22)	4(8.89)	0	0	0	0	40(88.89)
DMSSoftware Reengineering Toolkit	2(4.44)	0	5(11.11)	4(8.89)	0	0	34(75.56)
CAGEN Information Engineering Methodology	5(11.11)	1(2.22)	5(11.11)	0	0	0	34(75.56)
Oracle Designer	5(11.11)	1(2.22)	1(2.22)	0	0	2(4.44)	36(80.00)
ArgoUWE	0	6(13.33)	0	0	0	0	39(86.67)
Visio 2000	0	0	8(17.78)	3(6.67)	0	0	34(75.56)
Visio 2007	0	7(15.56)	1(2.22)	3(6.67)	0	0	34(75.56)
ARTISO Visual Case	0	2(4.44)	0	0	0	3(6.67)	40(88.89)
DB-Main	0	0	0	2(4.44)	0	5(11.11)	38(84.44)
I graphs Flow Charter	5(11.11)	2(4.44)	0	0	0	0	38(84.44)
Rational Rose	0	10(22.22)	0	3(6.67)	2(4.44)	0	30(66.67)
ARGOUML-AntsProfiler	0	4(8.89)	0	0	0	0	41(91.11)
Visible Analyst	2(4.44)	3(6.67)	0	0	0	0	40(88.89)

Turbo Analyst	0	6(13.33)	0	8(17.78)	3(6.67)	0	28(62.22)
SQL Query Profiler	0	0	9(20.00)	9(20.00)	3(6.67)	0	24(53.33)
Code Smith Generator	0	1(2.22)	2(4.44)	2(4.44)	5(11.11)	0	35(77.78)

Note: Values in the Bracket Indicate Percentages
Sources: Authors Compilation

From the above Table-1, it is clear that CASE Tools are highly used in IT industry to reduce time period required for implementation of software. Most of the employees agreed that tools like CAGEN Information Engineering Methodology (11.11 percent), Oracle Designer (11.11 percent) and I graphs Flow Charter (11.11 percent) are highly used in Analysis Phase of SDLC Whereas Meta CASE Tool (24.44 percent) used in Design phase of SDLC. It is followed by use CASE Tool like SQL Query Profiler(20.00) in Coding & testing phase, Code Smith Generator(11.11) in implementation phase, DB-Main(11.11) in Maintenance Phase.

It is clear that in IT industry instead of Analysis, CASE Tools are used in Designing, Coding, Testing and Maintenance phases of SDLC. Meta CASE Tool is highly used in Design followed by SQL Query Profiler in coding & testing phase as compared to the other tools.

Study also focus on various factors like Reduce Labor Work, Improve Performance, High Accuracy, Reduce Human Errors, and Low Time etc., that inspire employees to make use of CASE tools in SDLC. Following Table No. 2 shows the ratio of all the inspiring factors

Table-2: Factors Inspires to Employees to use CASE Tools

Inspiration Factors	Number of Respondents		Total
	Yes	No	
Reduce Labor Work	34(75.56)	11(24.44)	45 (100)
Improve Performance	41(91.11)	4(8.89)	46 (100)
High Accuracy	37(82.22)	8(17.78)	47 (100)
Reduce Human Errors	32(71.11)	13(28.89)	48 (100)
Less Time	26(57.78)	19(42.22)	49 (100)

Note: Values in the Bracket Indicate Percentages
Sources: Authors Compilation

From the above Table-2, it is clear that by making use of CASE Tools performance of employees has been improved (91.11 percent) followed by high accuracy (82.22 percent), reduction in labor work (75.56 percent) & human errors (71.11 percent) and less time (57.78 percent). By using CASE Tools the performance, accuracy has been increased and labor work, human errors and time required for implementation has been reduced.

Impact of CASE TOOLS

Second Objective of the study is "To identify the impact of CASE tools on human resource of IT industries". For this objective, researcher has considered the employees opinion whether CASE tools has reduced the requirements of employees in IT industries by reducing work load of employees with more accuracy and less errors.

Table-3: Reduce Requirements of Employees

Responses	Number of Respondents
Agree	30 (66.67)
Disagree	8 (17.78)
Can't say	7 (15.55)
Total	**45(100.0)**

Note: Values in the Bracket Indicate Percentages
Sources: Authors Compilation

From the Table-3, it clear that 66.67 percent employees are agreed that use of CASE Tools reduce the employee's requirements followed by 17.78 percent employees disagreed and 15.56 percent employees cannot say anything about use of CASE Tools with respect to employee's requirement. Therefore, we can say that use of CASE Tools reduces the requirements of employees in IT industries.

Pros and Cons of CASE Tools

Third Objective of the study is "To study the pros and cons of CASE Tools with respect to development time and cost". For this objective, researcher has asked five point rating scale to the employees for determining the pros and cons of CASE tools by considering various factors with respect to SDLC.

Phase wise Usage of CASE Tools: SDLC have many phases like Analysis, Design, Coding, Testing and Maintenance. It is need to calculate phase wise usage of CASE Tools in SDLC, so that it helps to identify in which phases most of the time IT industry make use of CASE Tools.

Table-4: Phase wise Usage of CASE Tools

Phase cannot be done without CASE Tools	Yes	No
Analysis	44(97.78)	1(2.22)
Designing	45(100)	0
Coding	25(55.56)	20(44.44)
Testing	37(82.22)	8(17.78)
Maintenance	35(77.78)	10(22.22)

Note: Values in the Bracket Indicate Percentages
Sources: Authors Compilation

From the above Table No. 4, it is come to know that 97.78 percent IT industries used CASE Tools for analysis phase followed by 100 percent for design phase, 55.56 percent for coding phase, 82.22 percent for testing phase and 77.78 percent for maintenance phase. Designing phase is the most CASE Tool dependent phase, followed by Analysis, Testing, Maintenance, Coding resp.

Expectations from CASE Tools: Now a day, most of the IT industry makes use of CASE Tools in SDLC. Whenever IT industry uses CASE Tools in SDLC, they have lot of expectation from these tools. They expect that CASE Tools should increase performance, user-friendliness in less cost and time and it should be reliable, portable with various platform and high flexibility. For studying of various expectations from employee's point of view, researcher has used 5-pointscale, calculated Average value, and further Rank them.

Table-5: Expectations from CASE Tools

Expectation Factors	SD (1)	D (2)	N(3)	A(4)	SA (5)	Total	Average	Rank
Performance	0	0	0	3	42	45	4.93	1
User-Friendliness	0	0	1	8	36	45	4.77	2
Time Requirement	1	0	0	11	33	45	4.66	3
Reliable	0	1	5	25	14	45	4.15	4
Platform Independent	0	0	8	26	11	45	4.06	5
Flexibility	0	1	5	32	7	45	4.00	6
Cost	0	0	19	20	6	45	3.71	7

Note: SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree and SA-Strongly Agree
Sources: Authors Compilation

From the above Table-5, it clears that the most of the employees expect that performance should be increased with Average value 4.93 and hence they gives first rank to it. Second Rank follows it to User-Friendliness (4.77), Third rank to Time Requirement (4.66), fourth rank to Reliability (4.15), Fifth rank to Platform Independent (4.06), Sixth rank to Flexibility (4.00) and seventh rank to cost (3.71).Therefore, it clears that most of the employees expect that performance should be increased by making use of CASE Tools during SDLC.

Pros and Cons of Usage of CASE Tools: CASE Tools have number of advantages and it helps to maintain quality in software by reducing time and cost. In addition, it increases the speed of development process. For study of advantages of CASE Tools, researcher has used 5-point scale and collect data from employees. Researcher has calculated average value and basis on that further rank has been given to each average value. Following Table No. 6 shows the pros and Table no.7 shows the cons of usage of CASE tools.

Table-6: Pros of Usage of CASE Tools

Factors	SD (1)	D (2)	N(3)	A(4)	SA (5)	Total	Average	Rank
Improved Quality	0	0	1	28	16	45	4.33	1
Reduced Time & Cost	0	0	7	27	11	45	4.08	2
Impact on style of working of company	0	1	15	21	8	45	3.80	3
Produce high quality and consistent document	0	1	16	19	9	45	3.80	3
Improved Co-ordination Amongst Employees of same project	0	0	18	22	5	45	3.71	4
Increased speed of processing	1	1	14	24	5	45	3.68	5
Reduced Maintenance Cost	0	6	15	17	7	45	3.55	6

Note: SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree and SA-Strongly Agree
Sources: Authors Compilation

From the above Table-6, employees given first rank to Quality (4.33) followed by Second rank to Reduced Time & Cost (4.08), Third rank to Impact on style of working of company (3.80), Fourth rank to Produce high quality and consistent document (3.80), Fifth rank to Improved Co-ordination Amongst Employees of same project (3.71), Increased speed of processing(3.68) and Sixth rank to Reduced Maintenance Cost(3.55).As per the point view of employees, improvement in quality, reduction in development cost & maintenance cost, time, and increase in speed are the most advantages of CASE Tools.

Table-7: Cons of Usage of CASE Tools

Variables	SD (1)	D (2)	N (3)	A (4)	SA (5)	Total	Average	Rank
Training	2	1	3	30	9	45	3.95	1
Completeness and syntactic correctness does NOT mean compliance with requirements.	1	1	15	12	16	45	3.91	2
Not necessarily prevent people from making unexpected output.	0	3	13	15	14	45	3.88	3
Cost.	2	3	7	23	10	45	3.80	4
Limitations in the flexibility of documentation.	1	0	14	23	7	45	3.77	5
Difficult To Customize.	1	1	13	26	4	45	3.68	6
Compatibility with available system.	0	2	19	20	4	45	3.57	7
Staff resistance to CASE tools.	1	2	21	16	5	45	3.48	8

Note: SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree and SA-Strongly Agree
Sources: Authors Compilation

From the above Table-7, Employees given first rank to training (3.95) followed by Second rank to completeness and syntactic correctness does NOT mean compliance with requirements (3.91), Third rank to Not necessarily prevent people from making unexpected output (3.88), Fourth rank to Cost (3.80), Fifth rank to Limitations in the flexibility of documentation (3.77), Sixth rank too Difficult to Customize (3.68), Seventh Rank to Compatibility with available system (3.57) and Eighth rank to Staff resistance to CASE tools(3.48). All the Average values of Advantage factor are higher as compared to the disadvantage factors. Therefore, we can conclude that to make use of CASE Tools in SDLC have more advantages over disadvantages.

Testing of Hypothesis

Various statistical tools used to test the hypotheses. If the replies of a majority of the respondents support a hypothesis then that hypothesis will be considered as confirmed. Otherwise, it will be considered as rejected. The data connected with the hypothesis and obtained from respondents has been used for this purpose.

Hypothesis-1:"Use of CASE Tools in SDLC reduces Human Resource**"**

Step 1: Setting Hypothesis

As per the Table-3: Reduce Requirements of employees, H_0 and $H_1$are:

H_0: Null Hypothesis: 66% or more employees have a positive attitude that Use of CASE Tools in SDLC reduces human resource. (H0: p = .66)
H_1: Alternate Hypothesis: < 66% employees have a positive attitude that Use of CASE Tools in SDLC reduces human resource.

(H1= p < .66)

H_0: p =0.66
H_1: p < 0.66 (One tail test as rejection area is towards one side)

Step II: Sample Size

n=45 (> 30) large sample test i.e. Z-test is used.

Step III: Calculation of S.E. (Standard Error)

S.E=$\sqrt{pq/n}$ = **7.0611**

Step IV: Calculation of Z value

Z= diff. / S.E.
Z_{cal}= 0.0948

Step V: Table value of Z for one tail test at 5% level of significance is 1.64. Calculated value of Z (0.0948) < 1.64 hence we accept null hypothesis which means more than 66 percent employees have a positive attitude that Use of CASE Tools in SDLC reduces human resource. It means that **"Use of CASE Tools in SDLC reduces human resource"** and hence **the hypothesis of the study is accepted.**

Hypothesis 2: **"**CASE Tools reduces software development Cost and Time**"**

Step I: Sample Size

As per Table No. 7: Advantages of Usage of CASE Tools Average Scale of factors of values of Improved Quality, increase Speed, Reduced Development & Maintenance cost of software and also Time required to implement software in SDLC.

Table-8: CASE Tools reduces Software Development Cost & Time

Sr. No.	CASE Tools Reduces Software Development Cost and Time	Number of Respondent	Percent	Average Scale
1	Strongly Agree	11	24.44	4.33
2	Agree	27	60.00	
3	Neutral	7	15.56	
4	Disagree	0	0	
5	Strongly Disagree	0	0	
Total		45	100.00	

Sources: Authors Compilation

Step II: Conclusion

The percent and average scale of responses were calculated by using the ratings. It is clear that 75.56 percent employees were agreed about the use of CASE Tools in SDLC reduces Software Development Cost and Time. In addition, the calculated value of average point rating scale is 4.33 represent the majority of the employees are agreed about the use of CASE Tools in SDLC. Therefore, it is to be concluded that, the hypotheses, which is stated in the present study, is positively accepted.

FINDINGS, CONCLUSION &SUGGESTIONS

It is observed during the course of the published research material on the subject of the study was strictly limited and a number of areas and aspects required wider and in-depth research in future.

Findings

- 11.11% IT industry use CAGEN Information Engineering Methodology, Oracle Designer and I graph Flow Charter CASE Tools in Analysis Phase of SDLC Whereas 24.44 percent use Meta CASE Tool used in Design phase of SDLC.
- 20 percent IT industry use SQL Query Profiler CASE Tool for Coding & testing phase as compared to other phases of SDLC whereas 11.11 percent IT industry use Code Smith Generator for implementation phase and 11.11 percent IT industry use DB-Main in Maintenance Phase.

- 91.11 percent employees agreed that by using of tools performance has been improved followed by 82.22 percent employees agreed that high accuracy is maintained, 75.56 percent employees agreed that reduction in labor work & 71.11 employees agreed that human errors are reduced and 57.78 percent employees are agreed that less time required for implementation of software.

- 66.67 percent employees are agreed that use of CASE Tools reduce the employee's requirements followed by 17.78 percent employees disagreed and 15.56 percent employees can't say anything about use of CASE Tools with respect to employees requirement.

- 97.78 percent IT industries used CASE Tools for analysis phase followed by 100 percent for design phase, 55.56 percent for coding phase, 82.22 percent for testing phase and 77.78 percent for maintenance phase..

- Most of the employees expect that performance should be increased with Average value 4.93 and hence they give first rank. It followed by Second Rank to User-Friendliness (4.77), Third rank to Time Requirement (4.66), fourth rank to Reliability (4.15), Fifth rank to Platform Independent (4.06), Sixth rank to Flexibility (4.00) and seventh rank to cost (3.71).

- Employees given first rank to Quality (4.33) followed by Second rank to Reduced Time & Cost (4.08), Third rank to Impact on style of working of company (3.80), Fourth rank to Produce high quality and consistent document (3.80), Fifth rank to Improved Co-ordination Amongst Employees of same project (3.71), Increased speed of processing (3.68) and Sixth rank to Reduced Maintenance Cost (3.55).

- Employees given first rank to training (3.95) followed by Second rank to completeness and syntactic correctness does NOT mean compliance with requirements (3.91), Third rank to Not necessarily prevent people from making unexpected output (3.88), Fourth rank to Cost(3.80), Fifth rank to Limitations in the flexibility of documentation(3.77), Sixth rank too Difficult To Customize(3.68), Seventh Rank to Compatibility with available system (3.57) and Eighth rank to Staff resistance to CASE tools(3.48).

- Usage of CASE tools is high in IT industries of Pune city.

- CASE Tools are responsible for developing quality software.

Conclusions

This research proved that there are most users of CASE Tools. Due to less time, employees prefer to use CASE tools for their work. Maximum respondent give response in the favor of analysis, designing and testing phases. Thus, researcher can conclude that CASE Tools are important part of analysis, designing and testing phases of SDLC. Maximum employees from IT Sector of Pune city are using CASE tools. There is a heap of CASE tools available for various purposes. Many companies develop many other tools for their internal purpose only.

- It is clear that in IT industries instead of Analysis CASE Tools are used in Design, coding, testing and maintenance phases of SDLC.
- Meta CASE Tool is highly used in Design followed by SQL Query Profiler in coding & testing phase as compared to the other tools.
- CASE Tools increase performance, accuracy, reduced labor work, human errors, and required time for implementation of software.
- CASE Tools reduces the requirements of employees in IT industries.
- Designing phase is the most CASE Tool dependent phase, followed by Analysis, Testing, Maintenance, Coding respectively.
- Most of the employees expect that performance should be increased by making use of CASE Tools during SDLC.
- As per the point view of employees, improvement in quality, reduction in development cost & maintenance cost, time, and increase in speed are the most advantages of CASE Tools.
- Make use of CASE Tools in SDLC have more advantages over disadvantages.

Suggestions

The respondents have put forward certain suggestions, which have been summarized into a more organized form by the researcher:

- Instead of using CASE Tools in only Design and testing phases, need to create awareness and importance of CASE tools with other phases of SDLC.

- Mention more number of CASE Tools, which are popularly used, with some models of development.
- Consider simplified CASE Tools for Object-Oriented Analysis and Design.

REFERENCES

1. Church, T., & Matthews, P. (1995, July 10-14). ***An Evaluation of Object-Oriented CASE Tools: The Newbridge Experience.*** Paper presented at the 7th International Workshop on Computer Aided Software Engineering, Toronto.

2. Retrieved from http://www.dspace.mit.edu/bitstream/handle/1721.1/2475/1/SWP-3579-45082634.pdf

3. Massacci, F., Mylopoulos, J., & Zannone, N. (2007). Computer-aided Support for Secure Tropos. ***Automated Software Engineering,*** 14(3), 341 – 364.

4. Francis Kofi Andoh-Baidoo Published, Ross E. Walker and K. Niki Kunene his research on. ***An Evaluation of CASE Tools as Pedagogical Aids in Software Development Courses.***

5. Ohst, D. (2002). A fine-grained version and configuration model in analysis and design. In: ICSM '02, ***IEEE,*** 5.

6. Orlikowski, W. J. (1989). Division among the Ranks: The Social Implications of CASE Tools for System Developers**.** ***In Proceedings of the Tenth International Conference on Information***

7. Nelly, Bencomo, Paul Grace, Carlos Flores, Danny Hughes, & Gordon Blair. (2008). Genie: Supporting the Model Driven Development of Reflective, Component-based Adaptive Systems. ***In Proceedings of the 13th international conference on Software engineering -ICSE '08, (pp. 811-814).*** Leipzig, Germany.

8. Koegel, M., Li, Y., Naughton, H., & und, Helming J. (2009). ***Towards a Framework for Empirical Project Analysis for Software Engineering Models***. 2010 ASE VASE Workshop, New Zealand: Auckland.

9. Helming, Jonas, Koegel, Maximilian, Naguib, Hoda, Schmidberger, Miriam, Schneider, Florian, & Brüg, Bernd. ***An Analysis of Tool -based Research in Software Engineering*** (Published).

10. Retrieved from https://www.edocs.uis.edutmims1wwwmastersprojectfinalrogerfinal10.pdfrogerfinal10

11. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.95.6793&rep=rep1&type=pdfdocument

12. Retrieved from http://www.cs.nott.ac.uk/~cah/G53QAT/Report08/mxr06u%20%20WebPage/The%20repository.html

13. Retrieved from http://sunset.usc.edu/events/2000/oct24-27-00/Abstracts/jobaik.pdfjobaik

14. Retrieved from http://csse.usc.edu/csse/TECHRPTS/1999/usccse99-528/usccse99-528.pdfusccse99-528

15. Retrieved from http://www. trese.cs.utwente.nl/automatingOOSD/papers/Greefhorst.pdf

16. Retrieved from http://www.theecommercesolution.com/usefull_links/case_tools.php

17. Retrieved from https://www.scribd.com/doc/264662/What-is-a-Business-Analyst

18. Retrieved from http://sunset.usc.edu/publications/TECHRPTS/1999/usccse99-528/usccse99-528.pdf

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VIRTUALIZATION TOWARDS CLOUD COMPUTING: A FUTURISTIC APPROACH IN MANAGING THE INTERNET

Dr. N. K. Ojha[7] Mridul Dharwal[8] Dr. A. V. Jain[9]

ABSTRACT

Virtualization in both computer systems and network elements is becoming increasingly part of the Internet. Aside from posing the new challenges, virtualization enables new functionalities, and show the future Internet architecture, which contains a physical, but polymorphic, substrate on which the various parallel infrastructures can be constructed or design on demand. This article explores such a new "architecture of virtual infrastructures". The FEDERICA project and the recent evolution trends in the National Research and Education networks are to be taken as examples of this new type of network infrastructure, which is an evolution of the classic network.

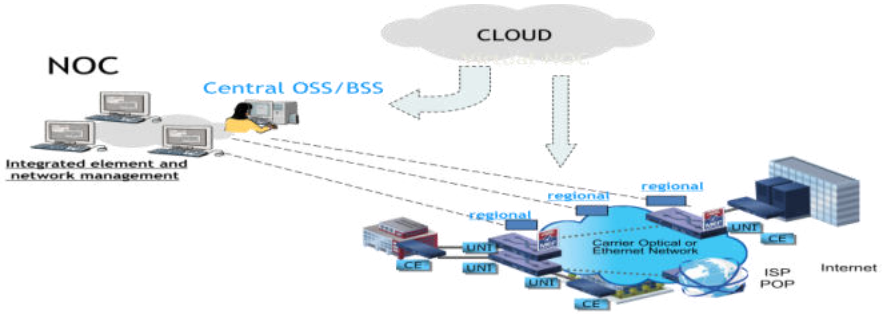
KEYWORDS

Virtualization, Networking, NREN, GÉANT, FEDERICA, Infrastructure, Future Internet Architecture, IaaS, Cloud Computing etc.

INTRODUCTION

Recent advances in virtualization technologies, enabled by powerful hardware in ASICs and CPUs, have made it extremely easy to decouple the operating system from the physical components in computers. On a single hardware platform, more than one operating system can be active at the same time and the fairness of the sharing is enhanced by dedicated hardware. The enabler is usually a thin software layer (e.g. XEN [1], VMware [2], KVM [3]), which abstract the physical resources to a standard (virtual) system. Such advances create more degrees of freedom for the end users and, at the same time, more capabilities. The "cloud computing" [4] [5] paradigm is a clear example of the new type of services available. In data networks, virtualization has also been present since the beginning as a way to decouple the physical infrastructure from the service offered and it is still subject to research and development [6]. A single network infrastructure, like e.g. the GÉANT [7] backbone in Europe is currently hosting many virtual networks. Network virtualization technologies like MPLS (Multiprotocol Label Switching) and VLANS are common in commercial networks. At the same, the use of the Internet is evolving towards a very content-rich platform, in which computing power and data easily accessible from everywhere are the key elements. When virtualization technologies are added to all the basic elements, the new internet infrastructure becomes even more useful and efficient. It enables a more efficient use of the physical resources through resource "slicing", and makes the logical topology of important functionalities (routing, monitoring, computing and storage) less dependent on the physical topology, by introducing dynamic capabilities. Such an environment can be considered to be a polymorphic substrate capable of hosting user equipment and able to adapt rapidly to users' needs and events. Such an architecture exhibits a fabric (a physical substrate) composed of computing and network elements, each capable of virtualization Current innovations in the area of Grid & Cloud computing would push to prepare the path to redesign complex IT Network Management architecture utilizing Cloud-based purposive infrastructure by reusing of available computing and storage facilities. Virtualized multiple-agent technology represents an exciting new perspective of analyzing, designing and building complex network management systems. The autonomous, cooperative as well as purposive infrastructure with intelligent features of an agent make explicit that the agent-based system becomes a promising software solution in virtualized Cloud computing environments.

Figure-1



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The demand for bandwidth created by subscribers and devices has been rising steadily for a number of years. The amount of data carried by mobile networks is doubling roughly every year, and the number of connected machine-to-machine (M2M) devices – sensors and actuators is expected to reach 50 billion by 2020. However, average revenue per user (ARPU) is declining in most markets, and the price point for connectivity for many M2M devices is low.

EXPERIENCE IN THE NRENs

The purpose of the NRENs [11] is to serve and support researchers in networking. The users' requirements are increasingly for services that allow communities to work together ubiquitously, dynamically and rapidly. As a consequence, the development of NRENs in Europe and worldwide has created a strong multi-domain hybrid network infrastructure with advanced capabilities. These networks no longer provide to the users just IPv4 and IPv6 connectivity, but are also capable of creating many "virtual", parallel, infrastructure for the users on the same physical footprint. Such infrastructures are enabling better or novel uses of dedicated facilities, such as radio telescopes, large particle colliders and fusion reactors. Virtualization in various flavors is used to slice capacity both at the packet (VLANs, MPLS) and the circuit level (using Generic Framing Procedure as an example). Virtualization is also used to decouple the IP topology from the physical topology and to perform traffic engineering. In recent years, the developments related to virtualization are in two main areas:

- ***Multi-domain Services, such as Bandwidth-on-Demand, Security and Authentication***: The services are either in the trial or production phase. In particular the dynamic circuit network (DCN) [12] in ESnet and Internet and the AutoBAHN [13] service in GÉANT deal with the creation of virtual circuits on large scale. The challenge is to provide a real-time service, reducing the set-up time of a point-to-point virtual circuit. These multi-domain services require the development of new standards for protocols, resource representation and functionalities in equipment, as the NRENs have to create networks in an environment, which is intrinsically multi-vendor and multi-technology.

- ***Monitoring, Management and Control of the Infrastructure*:** These ancillary services become very complex when the same physical infrastructure hosts many virtual networks. The approach has been to develop a modular, multi-domain, distributed monitoring system (PerfSONAR [14]). The capability to monitor the virtual elements of the network is strongly determined by the functionalities provided by the network equipment. The NRENs are continuing to reduce the number of transmission protocols used. At the same time, they are increasing the number of Inter-domain protocols and the use of virtualization to provide advanced services. The NREN infrastructures are already supporting environments based on virtualization, which are evolving in size and complexity. The introduction of computing elements in the network topology is mandated by the need to control and manage all the virtual infrastructures created on the same multi-domain physical environment and it will permit a step further in the virtualization of the infrastructure functionalities like routing, monitoring, capacity offering.

FEDERICA

Research on Future Internet technologies and architectures has become a hot topic in computer science. There are many initiatives worldwide, e.g. GENI [15] in the United Stated and FIRE [16] in Europe. Such research requires new environments that combine flexibility and a minimum set of constraint for the researchers. FEDERICA (Federated E-infrastructure Dedicated to Researchers Innovating in Computer Architectures) is a European Commission co-funded project started in January 2008 and operational until June 2010, that created a scalable, Europe-wide, clean slate, infrastructure to support experiments on Future Internet. The main project objective is to create an e-Infrastructure for researchers on Future Internet allowing researchers a complete control of set of resources in a "slice", enabling disruptive experiments and placing the lowest possible set of constraints to researchers. Research on the use of virtualization in e-Infrastructure and facilitating the collaboration between experts are also key goals.

The V-NOC Architecture

Requirements As the scope is focused on a research environment on new technologies, the following set of requirements for the infrastructure has been assumed:

- Be technology agnostic and neutral (transparent) to allow disruptive and novel testing, as to not impose constraints to researchers. The requirement is valid for all networking layers, not just the application layer and extends to the operating system used.
- Ensure reproducibility of the experiments, i.e. given the same initial conditions, the results of an experiment are the same. This requirement is considered of particular importance.
- Provide to the user complete control and configuration capabilities within the assigned resources.
- Allow more than one user group to run experiments at the same time, without interference.
- Open to interconnect / federate with other e-Infrastructures and the Internet. This last requirement plans for access to slices, access to the control of slices, management of experiments, interoperability and migration testing.

Framework and Design

The requirements suggest two key framework choices for the infrastructure, which are at the core of the design:

- The simultaneous presence of computing and network physical resources. These resources form the substrate of the infrastructure.

- The use of virtualization technologies applied both to computing and network resources. Virtualization will allow creating virtual, un-configured resources. Virtualization is defined as the capability to create a virtual instance of a physical resource, both in the computing and network environment. The virtual resources (e.g. a virtual circuit, a disk partition, a virtual computer) are usually created by segmenting a physical resource. Virtualization may create non-configured (clean) virtual resources, e.g. an image of the hardware of a computing element on which (almost) any operating system can be installed, a point-to-point network circuit, a portion of disk space. Those resources can be then tailored to various needs and even moved from one virtualization-aware platform to another. Such framework leads to a design in which the infrastructure is considered to be built in two distinct layers:

    - **The Virtualization Substrate:** The physical infrastructure which contains all the hardware and software capable to create the virtual resources;

    - **The Layer Containing all the Virtual Infrastructures:** Each containing the virtual resources and the initial network topology connecting them. The virtualization substrate is a single administrative domain. The virtual infrastructures (VI or "slices") may be in principle unlimited, in practice a large number, restricted by the physical resources available and the requested characteristics for the slice.

THE FEDERICA INFRASTRUCTURE IMPLEMENTATION

The Infrastructure is Built Using:

- A mesh of Ethernet circuits at 1 Gigabit per second provided by the GÉANT backbone. The circuits are initially at 1 Gbps as this capacity allows slicing to relatively high -speed links and yet is still affordable as contribution by the participating NRENs. Most of the circuits are created over SDH using generic framing procedure and virtual concatenation. Figure-2 represents the current topology.

- Network equipment: Programmable high-end routers/switches: Juniper Networks MX480 with dual CPU and one line card with 32 ports at 1Gbps Ethernet. The MX functionalities include virtual and logical routing, MPLS, VLANs, IPv4, IPv6. The MX480 are installed in 4 core Points of Presence and 2 MX480 are equipped with Ethernet line cards with hardware QoS capabilities. Smaller multi-protocol switches (Juniper EX series) are installed in non-core PoPs.

- Computing equipment: PC based nodes (V-Nodes) running virtualization software, capable of implementing e.g., open source software routers and emulating end user nodes. Each PC contains 2 x Quad core AMD running at 2 GHz, 32GB RAM, 8 network interfaces, 2 x 500 GB disks. The V-Nodes are connected to the Juniper routers.

The initial choice of the virtualization software for the V-Nodes is VMware [2], the free version of ESXi. This choice has been made after a review of other virtualization software (e.g. XEN). In particular, the availability of usage examples and expertise and an upgrade path to better management using a commercial version of the software were important aspects of the evaluation process. The capabilities and performance of the free version have been adequate for the current requirements. These building blocks of the substrate pose very few constraints to the user. In the status of the infrastructure, the most significant one is that the data link layer is fixed to Ethernet framing. Future development may permit access to optical equipment to overcome this limitation.

ARCHITECTURE FOR VIRTUAL INFRASTRUCTURES

The project's architecture described above represents an implementation of a domain based on virtualization and capable of a large set of services, similar to the ones provided by cloud computing and augmented to include wide area networks communication. The substrate creates the possibility to host many infrastructures, each configured differently and simultaneously active. Domains containing such infrastructures can connect between them at the substrate level to offer common services. Such infrastructure can also connect with domains not based on virtualization, like the current Internet. The interconnection can be done by the substrate and by each slice in parallel, in this case a careful planning of the traffic routing and addressing is needed. The flexibility in configuration of the virtual environments, usage optimization, scalability and resiliency of the infrastructure make it appealing for a large variety of uses.

V-NOC BASIC KEY REQUIREMENTS

Scalability

Strong requirement for having a distributed cloud infrastructure instead of a centralized. The Virtual NOC architecture has to be able to support many users in the future, sharing their knowledge and data, currently only accessible via the local desktops of the NOC. Business effective

Fault-Tolerance

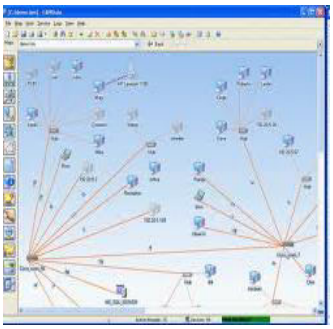
A decentralized system consisting of unreliable loosely coupled nodes have to be able to deal with failures such as network churn or node failures. The architecture has to take this into account, up to a certain degree, the system availability without any loss of service quality.

Flexibility

To support future extensions by new technologies and Telco service distribution, such as provider / consumer / prosumer paradigms. A flexible architecture is required to be able to integrate those extensions and offers new functionalities through existing APIs. Technology independent (multi-vendor technology) and from the specific OSS/BSS at deployed nodes level. To configure the dynamic downgrade or upgrade of available infrastructure resources

V-NOC Business Operating Requirements

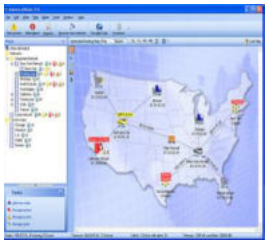
Provide a **virtualized NOC to third part entities** (network providers, operators, vendors etc.) in order to maximize the network management business (e.g. outsourcing).



Provide an (all-in-one) **immersive environment** with familiar NOC structures such as Network Elements, distributed storage systems, power equipment, and displays.

Provide a **multi-user virtual world** where users can effectively collaborate on elements of the NOC together.

Provide a **centralized graphical tool useful to manage network resources** as a real NOC, but which can be also used as a modeling and simulation tool (e.g. requirements monitoring and analysis) in order to make better use of network and storage resources, discussing measurements and consolidate monitoring.



The Virtual Network Operations Center (NOC) is organized as IaaS (Infrastructure as a Service). In the V-NOC concept the network operations and services management are provided by different entities in a distributed paradigm.

Each instance of the Virtual NOC is composed of the following components:

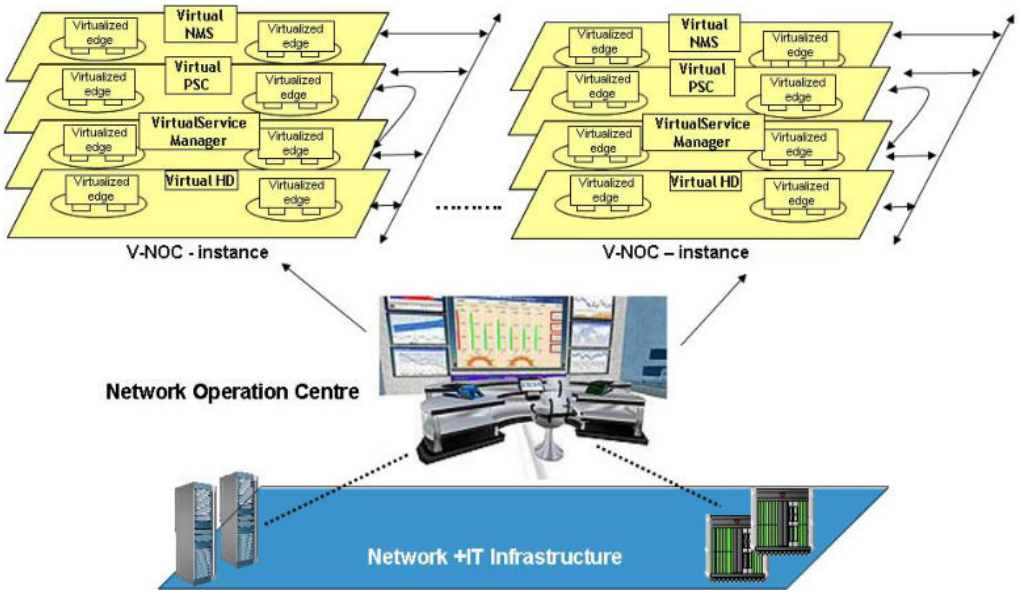
- **Virtual Network Management System** (NMS)
  Access port managers that have the administrative control of the overall Network Elements connected to the Virtual NOC, guaranteeing proper functioning. NMS provides network management and user support within their area of authority.

- **Virtual Help Desk**
  This entity monitors for connectivity problems and handles the trouble tickets System.

- **Virtual Service Manager**
  These are virtual entities, which design, specify and orchestrate the deployment of advanced services on the Virtual NOC infrastructure (networking and storage services)

- **Virtual PSC** (Project Steering Committee)
  It interacts with the access port managers and it makes decisions on strategic aspects of the project, and the deployed services.

Figure-1



Sources: Authors Compilation

THE V-NOC WORKFLOW

Phase-1: A Network Operation Centre could be managed virtually. Basic components of the V-NOC are accessible in ubiquitous way.

Phase-2: Use of Virtual Network Management System is composed of enhanced graphical users interfaces in order to plan, provision and monitors (in real-time) the physical changes in Infrastructure Provider's network.

Phase-3: New virtual services are offered using the Virtual Service Manager that could be called to design, specify and orchestrate the deployment of advanced services on the Virtual NOC infrastructure.

Phase-4: Interact with Virtual Help Desk system, in order to solve connectivity problems and handles the trouble tickets System.

Phase-5: The Virtual PSC (Project Steering Committee) is available to makes decisions on strategic aspects of the project and the deployed services.

RATIONALE OF STUDY

Since Internet has been largely deployed and utilized around the globe several business models have been adopted to yield revenues to all actors involved in the value chain. A consolidated one is based on gold services associated with "free" basic service offers. Good examples are YouTube, mega upload, mega video, Skype and recently announced Google on net QoS. Therefore, on top of the best effort quality, the internet is converging to a quality-managed cloud that shall need both high capacity generalized infrastructure and innovative generalized OSS / BSS (V-NOC) solutions also exploiting APIs to the service providers. Progress has to be made on Strategies for adherence to Web Service Resource Framework (WRSF) standards by extending the current Virtual NOC interface. This is likely to be achieved by its integration with OPENNEBULA low-level Cloud middleware implementations that conform to OCCI standards such as OGF.

CONCLUSION

The use of virtualization technologies in Internet is increasing and expanding. The advantages of adding computing capabilities to the network infrastructure are evident when coupled with virtualization. Such an infrastructure based on virtualization in all of its components and built with both computing and network resources may represent a new architecture for parts of Internet, in particular, it can provide an ideal environment for innovative research and rapid service development. The virtual infrastructures created, or slices, may contain any combination of the basic, "raw" fundamental virtual resources in arbitrary topologies and hosting any operating system and application type. Such virtual infrastructures allow full control to their owner, may easily connect to other infrastructures and are configurable in a short amount of time. The physical infrastructure in the NRENs and the

telecommunication environment are already capable of supporting virtualization in many of their components. The FEDERICA project is an example of the capabilities of current hardware and is researching on the many challenges of virtualization. The project will continue to support researchers and to develop the architecture of virtualization-based infrastructures. A strong connection to the research and standardization in cloud computing is expect.

REFERENCES

1. Paul, Barham et al, Xen, & The Art of Virtualization, (SOSP'03, October 19–22, 2003). ***Bolton Landing.*** New York. ACM 1-58113-757-5/03/001. Retrieved from http://www.cl.cam.ac.uk/research/srg/netos/papers/2003-xensosp.pdf
2. (1998). ***VMware Inc. is a provider of virtualization software founded in*** Retrieved from http://www.vmware.com
3. Kernel-based, Virtual Machine ***(KVM)***. Retrieved from http://www.linux-kvm.org/page/Documents
4. (10-7-09). ***For a definition of Cloud Computing***, see NIST Definition of Cloud Computing, P. Mell, T. Grance, Version 15. Retrieved from http://csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc
5. (2009, October). ***IEEE Computing now,*** System Virtualization, September 2009: Cloud Computing: Opportunities and Challenges. Retrieved from http://www.computer.org/portal/web/computingnow/articles
6. Chowdhury, N. M. M. K., & Boutaba, R. (2009, July). Network Virtualization: State of the Art and Research ***Challenges. IEEE Communications Magazine,*** 20-26
7. ***The European Research and Education backbone*** (GÉANT). Retrieved from http://www.GÉANT.net
8. Federated E-infrastructure Dedicated to Researchers Innovating in Computing Architectures**.** European Commission co-funded in the 7th Framework Work Programme, project n. RI-213107 ***(FEDERICA)***. Retrieved from http://www.fp7-federica.eu/
9. Szegedi, P., Figuerola, S., Campanella, M., Maglaris, V., & Cervello-Pastor, C. (2009, July). With Evolution for Revolution: Managing FEDERICA for Future Internet Research. ***IEEE Communications Magazine,*** 47(7), 34-39.
10. Campanella, M. (2009, October 19-21). The FEDERICA Project: creating cloud infrastructures. ***In Proceedings of Cloudcomp (CloudComp).*** Germany: Munich. ISBN 978-963-9799-77-6. LNICST.
11. ***For a detailed analysis of NRENs in Europe and their role***, see the documents (in particular the TERENA compendium). Retrieved from http://www.terena.org/publications/
12. ***Internet2 Dynamic Circuit Network***. Retrieved from http://www.internet2.edu/network/dc/
13. Campanella, M., Krzywania, R. et al. (2006, November). Bandwidth on Demand Services for European Research and Education Networks. ***Proceeding of the 1st IEEE International Workshop on Bandwidth on Demand, San Francisco, USA,*** Volume1, 65 – 72
14. Retrieved from http://www.techrepublic.com/resource-library/whitepapers/virtual-infrastructures-in-future-internet/
15. Retrieved from http://www.linkedin.com/pub/b-k-ojha/19/395/a72
16. Retrieved from http://www.fp7-federica.eu/about/documents.php

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DESIGNING OF COMPUTERISED INFORMATION SYSTEMS FOR SMALL ORGANIZATIONS

Dr. Deepak Jain[10]

ABSTRACT

Computerized information systems and other management information systems (MIS) are a way for organizations to try to increase their efficiency and handle the competitive markets. To design computerized information system to suite an organization can be a challenge, with all the layers and dimensions an organization can have.

This paper has tried to study small organizations and find factors that could help the designer of a computerized information system for a small organization. The factors are from the organizational culture and structure of the organization. To find these factors the Organizational theory is used.

The paper is a qualitative case study research that tries to interpret and understand the organization studied. The empirical data is gathered from documents, web sites and interviews. The analysis of the empirical data is done with the help of Organizational theory and the components of a computerized information system.

The result of this research is a list of ten factors that a designer should consider when designing a computerized information system for a small organization.

These factors are: a) Support remote work, b) The legislation, c) Support the possible growth of the organization, d) Support new actors, e) Access via the Internet, f) Able to introduce the customers into the system, g) Able to handle many simultaneous projects, h) Support the organizational structure of the organization (like centralized structure), i) Not time-consuming to use, and j) Support the performed tasks (both cultural and structural).

KEYWORDS

Computerized Information System, Organizational theory, Factors, Small Organization etc.

INTRODUCTION

In a world, that is constantly changing the control and redesign is getting increasingly more important for organizations. The pressure of being more efficient is an issue of organizations in all sizes. How an organization redesign itself can be crucial when it comes to the future of the organization to produce value and to keep a competitive advantage. An organization that is failing to reinvent itself can lose the struggle in the competitive constantly changing environment.

One way of re-invent, an organization is the implementation of computerized information systems such as a management information system (MIS). Designing a computerized information system for organizations can be a challenge for the designer, because of the differences in organizational structures and cultures on every organization.

Organizations

An organization is a constantly changing entity. It lives in an environment that is uncertain and unstable. In today's world of globalization, where things change in a fast pace and there is a huge flow of information, the flexibility and efficient ness of organizations has become more important than ever. An organization's possibility to succeed in todays marked has made the organization's ability to efficiently redesign itself crucial (Druckman, Singer & Van Cott 1997; Johnson, Scholes & Whittington 2005; Jones 1995).

Organizations are human creations, and reflect the desires, motivations and visions of its stakeholders. An organization is a tool to create value for the stakeholders, and this is the reason for the existence of organizations. Value is created when the organization achieves the goals that are set for it. Goals can be a statement of intent like a mission statement or a strategic plan with detailed set of objectives. The goal of an organization is stated to give a direction to the actors of the organizations and its tasks (Jones 1995; Salaman 2001).

An efficient organization designs and redesigns the organizational structure and culture such that it meets the needs of the organization's goals set to produce value. To increase the organization's efficiency is not an easy task and there is no ready-made formula for this. Any organizational design has to be adapted to the particular organization, because of the differences between

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every organization and situation. New technology is often implemented, such as management information systems, for a way to increase the efficiency of an organization (Cameron & Green 2004; Druckman et al. 1997; Jones 1995)

The structure of an organization is compiled of many tasks and a human system to reach the set goals for the organization. For both the actors who work in an organization as well as those who study the organization, it is significant to understand how an organization works and is designed, how its internal processes can change the organization and how change can be guided in the organization. There are many views and theories developed to handle the complexity of organizations, such as organizational theory and organizational behaviour theory and different systems theories (Druckman et al. 1997; Salaman 2001).

An organization's culture is affected by the human systems that are composed of the actors and other persons that interact with the organization. The way the human systems are coordinated also affects the organization's culture (Druckman et al. 1997; Salaman 2001).

The design of an organization refers to the structures of the organizations characteristics. An organization is made up of many characteristics, which makes it possible for many variations of the organizational design. The main characteristics are the size of the organization, organizational structure, the volume of specialization of the human system, the behaviour of the actors in the organizations and the structural dimension of the organization. Other characteristics are the organizational culture, main processes and strategy of management (Druckman et al. 1997; Salaman 2001).

Control in an Organization

The actors are one of most important resource in an organization. The interaction of actors in an organization is important for an organization to be successful; this is why the control of the interactions between actors and their tasks is important (Johnson et al. 2005).

For a system or organization to generate an output, it requires many sets of tasks to be conducted. There are many types of tasks and every task has to have a task actor that is specialized on a specific task. The tasks can be such as designing, marketing, selling and manufacturing. In every task, there are many subtasks. The task roles can be such as sales persons and marketing managers (Jones 1995; Olson 2001).

There is no clear or universal way of solving control problems. One common way of trying to solve control problems is by centralization. This means that all information from the actors and the systems are sent to a common decision maker to controls the organization, in issues like when a certain task will be performed and by whom. Another way of controlling organizations and its tasks is by computerized information systems (Olson 2001).

Technical Development in an Organization

New technology is often implemented, when there is a need for the organization to redesign itself. The organizational design of a technological development has as three different effects on an organization. The first effect is viable implications on the organizational structure by the use of technology, so that organizations can grow its produced outputs and reduce the volume of the actors' at the same time. Another impact is shown in the use of technical aids like communication tools that can change the design and the decision structure of the organization (Druckman et al. 1997).

This structural change can be seen in elimination of hierarchical layers of the organization and can lead to a more efficient organization. However, this elimination of layers can also lead to problems in coordination that the middle managers have had to handle before the implementation of the computerized information system (Druckman et al. 1997).

The third effect that a technical development can have on an organization is the effect the use of new high-risk technologies can have on the stability of the organization's structure. The new technologies can be a gamble on the part of the organization and can make the organization have to do rearrangements to accommodate the new technology. A high-risk technology for an organization can be a new pioneer computerized information system, which often can have been costly to develop and is not a certainty if it will do what it is planned set to achieve (Druckman et al. 1997).

PURPOSE OF STUDY

An organization, whether it is a small or a big organization, is a large system with many aspects and dimensions. When implementing or designing a computerized information system for an organization many factors should be taken to consideration. The factors can be found in the cultural and the structural aspects of the organization. These factors might be overlooked but can be important to take into consideration to make a functional computerized information system for an organization.

In this research, the focus is on small organization with only 3-10 actors working in the organization. Small organizations have a different structure than a larger organization and smaller organizations may have a different need when it comes to a computerized

information system. In a small organization, there can be a lack of a formal organizational structure. This can lead to that the organization is inefficient and uses much time planning and controlling processes.

The purpose of this research is to find factors that should be taken into consideration when designing or implementing a computerized information system for a small organization. The factors will be studied from both the cultural and the structural aspects of the organization.

The factors are going to be an aid for the designer of a computerized information system for a small organization. The factors can also be used to help for choosing the most suitable computerized information system in the market.

The Research question

What are the factors that should be taken into consideration when designing a computerized information system for a small organization?

LIMITATIONS AND DELIMITATION

This research will only focus on small organizations with less than 10 actors. This is because big organizations and small organizations may differ a lot for each other structurally and culturally.

The focus in this research is to study the cultural and the structural aspects of the organization. The environment of the organization is not on focus. The study will be done in one case site.

The study is only trying to find factors that should perhaps be taken into consideration when designing a computerized information system. There is no emphasis on how to implement the factors to the designing process. The research will not study if a computerized information system will have any effect on the efficiency in the case site or in other small organizations.

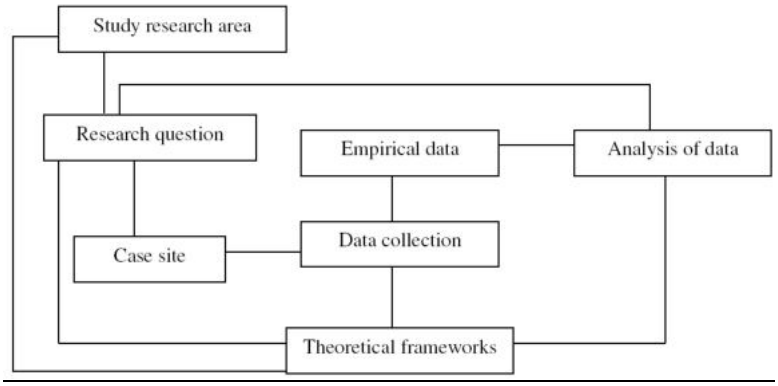
STRUCTURE OF STUDY

The research begins with being acquainted with relevant material for the research. With the gathered material, the purpose of the study and the research question are compiled. To answer the research question data is collected from the case site. A theoretical framework used for this research will be used to collect the relevant data from the case site. The empirical data that is collected from the case site will be analyzed to answer the research question.

The theoretical framework will be also used when analyzing empirical data. The analyzed data will be categorized with another framework.

The illustration of the structure of the research is shown in figure below. The research is an iterative process, and the structure of the study makes it possible to go back to previous steps in the writing processes, when the knowledge of the research situation gets clearer.

Figure-1



Sources: Authors Compilation

The research approach used for this research is a qualitative research approach. The research strategy of the research is the case study.

The empirical data for this research will be collected from ABC Ltd, which is the case site. The reason for choosing ABC Ltd is that it fits the set limitation of the research and that they have a need for a computerized information system in the near future. Also ABC Ltd has some issues with control in the organization.

The main source of empirical data is collected through interviews from the case site. Secondary data is collected from documents. Additional secondary data will also be collected from the case site's web pages.

ORGANIZATIONAL THEORY

"Organizations are systems of inter-dependent human beings." (Pugh 1990).

The reason for choosing organizational theory and the used sources are that the presented views of organizations are similar to the researcher's view. In addition, the focus of the organizational theory is the most suited for this particular research. Organizational theory is used for this research to study the organization chosen as the case site.

Other theories that were studied for this research, such as the organizational behaviour, coordination theory and management theories were not as usable and compatible as the organizational theory (Cole 1996; Robbins 1996).

In the last couple of decade, the influence of the behavioral science on the study of people in organizations has led to the rise of organizational theory over the pure and more simplified management theory. This is because management is not seen any more as the controlling factor in an organization, but more as a function of the organization (Cole, 1996).

Organizational theory was designed for examining organizations as human systems. In organizational theory, the organization is looked upon as a system with interlinking task roles. Organizational theory focuses on the performance and effectiveness of the organization as a whole. The theory is mainly used to study the functions of an organization and how to increase the efficiency of the organization (COTCOS; Johnson Jr 2005; Jones 1995).

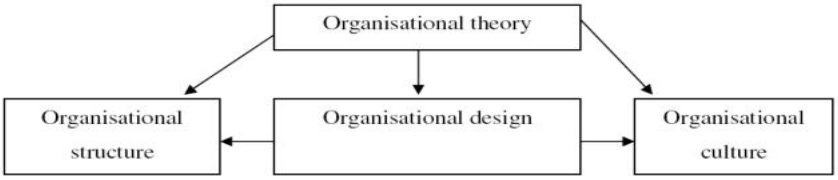
Functions affecting organizations are the organization's environment, the technology and internal processes that develop in an organization over time. These functions cause uncertainty and affect the organization's choice of structure and culture. Organizational theory is also used to study how an organization, the actors within the organization and the environment affects each other (Jones 1995; Mintzberg & Quinn 1996).

To understand how to influence an organization, it is important to know how the organization operates. Organizational theory tries to explains what factors should be taken to consideration when designing an organizational structure and culture to control and coordinate the resources (Jones 1995).

According to Handy (Cole 1996), the relationship between management and organizational theory can be summed to the concepts from organizational theory: task roles, tasks, organizational structure, systems thinking, organizational culture and interaction between task roles.

Organizational theory tries to understand the principles that govern how an organization works, evolves and reshapes its structure and culture. The theory also tries to understand the factors that affects the way and organization work, evolves and reshapes. With organizational theory, it is possible to analyses the structure and culture of an organization, find the existing problem and use organizational design to try to resolve the problems. In figure-2, the relationships of organizational theory are illustrated (Johnson Jr 2005; Jones 1995).

Figure-2



Sources: Authors Compilation

Organizational Structure

An organizational structure is a formal system with formal rules, tasks and relationships. With the rules, tasks and relationship the organization is controlling the relationships of the actors within the organization and also how the resources of the organization is used to achieve the goals of the organization. An organizational structure shows how the tasks are formally divided and coordinated (Jones 1995; Robbins 1996; Salaman 2001).

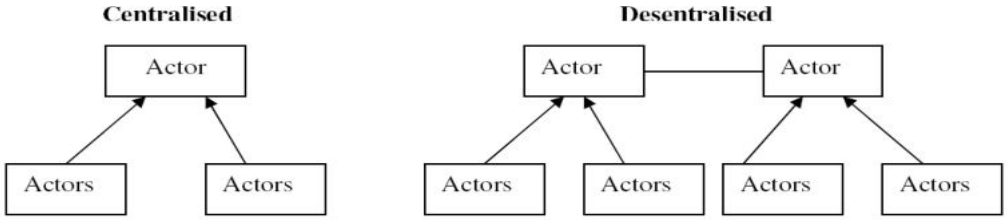
An organizational structure is based on a system with interlinked task roles and relationships of one role to another are defined by task-related behaviour. The organizational role is a set of task-related behaviour required of the actor's position in the organization. The organizational role of the waiter in a restaurant is to provide quick service to customers (Jones 1995; Mintzberg & Quinn 1996).

Organizational structure is used to control the coordination of the actors of the organization to reach the set goals and to control the means used to control actors in the organization. As an organization is established to reach set goals, the structure of the organization reshapes to increase the effectiveness of the organization's control of the task to achieve the set goals. Control is the main reason for the organizational structure (Jones 1995; Mintzberg & Quinn 1996).

To all organizations, the suitable organizational structure is the one that facilitates effective responses to problems of coordination and motivation. The problems faced can be from environmental, technological and human resource reasons. The structure of an organization changes and reshapes as the organization grows and evolves. With the process of organizational design, the structure of an organization can be managed and changed (Jones 1995).

There are many types of organizational structures. One way of dividing, the organizational structures are through two basic organizational structures: the centralized and the decentralized structures (figure-3). In the centralized structure, all control is centered to one actor or place in the organization. A decentralized structure is a structure where many actors share the control and responsibility of the organization. These actors can be the managers of a group of actors in the organization. (Jones 1995; Mintzberg & Quinn 1996)

Figure-3: A Simplified Illustration of a Centralized and Decentralized Structure



Sources: Authors Compilation

There are many other ways of diving and identifying the organizational structure, but they are often designed for large organizations and not for small organizations that can lack a formal organizational structure. Because the research is focused on small organization, other organizational structures are not represented (Jones 1995; Mintzberg & Quinn 1996).

Different organizational structures make actors behave different ways. There is no one correct organizational structure or way how to design one. When redesigning an organizational structure two things must be taken into consideration: what is tried to achieve by the redesign and how will the choices of the redesign have on the organization's stakeholders (Jones 1995).

There are many difficult choices to be made when it comes to designing and redesigning an organizational structure. Like how to control the processes and the people in the organization, to make the most of the organizations abilities to create value (Jones 1995).

Organizational Culture

An organizational culture is the shared value that controls the interaction between the actors in the organization, the suppliers, customers and others outside the organization. The actors remold the culture of an organization, such as the organization's ethics, employer's rights and structure (Jones 1995; Salaman 2001)

The culture of the organization affects how the people react to situations and their interpretation on organization's environment. Like the organizational structure, organizational culture controls and reshapes the behaviour within the organization. Organizational culture is reshaped and can possibly be managed through organizational design (Jones 1995).

Organizational Design

Organizational design is a process where the organization's managers chooses and manages many levels and components of the organizational structure and culture to control the processes necessary to achieve the set goals of an organization. The organizational design tries to handle difficult issues and choices about how to control the organization its actors, to make the organization more efficient (Jones 1995).

Organizational design affects many aspects in an organization such as the competitive advantage, the organization's ability to be flexible and manage diversities, the efficiency of the organization and the control of the organization's environment (Jones 1995; Mintzberg & Quinn 1996).

The organizational design process tries to keep the organization alive by balancing the need of the organization to manage and handle the pressures of the organization: both the internal as well as the external (Jones 1995; Johnson et al. 2005).

It is important to continue being effective and successful as the organization and its surrounding environment reshapes and changes, which makes the deigning of the organization vital for an organization's lifespan (Jones 1995; Johnson et al. 2005).

COMPUTERISED INFORMATION SYSTEMS

"An Information system can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in a organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new projects." (Laudon & Laudon 2004, p. 8)

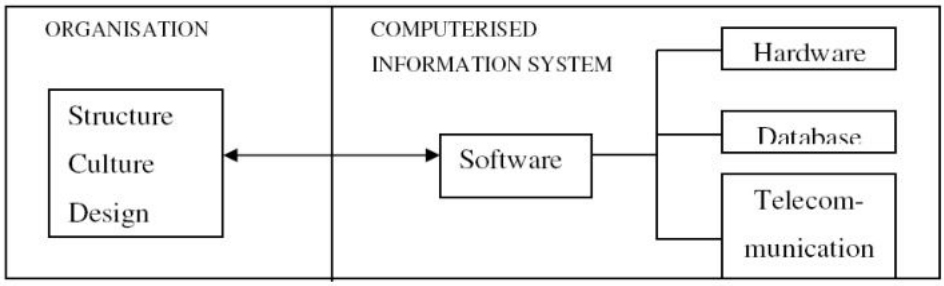
Organizations, both large and small, are using information systems and networks to achieve more efficiency and competitiveness. Implementing an information system is one way for an organization to re-invent itself. Information systems are used to reach new markets and locations, reshape and re-coordinate the processes of the organizations (Laudon & Laudon 2004).

There are many types of computerized information systems like transaction processing systems, management information systems, decision support systems and expert system. As all information systems, a computerized information system exists to serve, help or support actors in the real world (Checkland & Holwell 1999).

A computerized information system is a system that relies on hardware and software of computers to process and distributed information. As any viable system a computerized information systems has an input, process and output (Laudon & Laudon 2004).

In figure-4 is the interdependency of an organization and a computerized information system illustrated. The organization's structure, culture and design are interdependent with the computerized information system's software, hardware, database and telecommunication (Checkland & Holwell 1999; Laudon & Laudon 2004).

Figure-4: The Interdependency of Organizations and Computerized Information Systems (Laudon & Laudon 2004)



Sources: Authors Compilation

The software, hardware, database and telecommunication are components of the computerized information system (Laudon & Laudon, 2004). These components will be used for categorization of the factors found in the empirical study.

RESEARCH APPROACH: A QUALITATIVE RESEARCH

The history of qualitative approach can be track back to the eighteenth-century. The qualitative approach became relevant in the 1960's when the dissatisfaction for the quantitative approach grew. The critic was raised on fact that quantitative approach often did not study the often-obvious subjective issues (Denzin & Lincoln 1998a; Soininen 1995).

The qualitative research is a creative and interpretive approach. It tries to explain more in-depth human issues and tries to study things without much interference and in their natural state. A researcher doing a qualitative research usually uses her earlier experiences when conducting the study. To analyses collected data in a qualitative research can be a complex and difficult process (Denzin & Lincoln 1998a; Denzin & Lincoln 1998b; Denzin & Lincoln 1998c).

The nature of this research is interpretive and human oriented. From the gathered data, the goal of this research is to get a deep understanding of the case site and to find the factors that a designer could use when making a computerized information system for a small organization. For these reasons, the approach of a qualitative research is most suited for this particular research.

Research Strategy – Single Case Study

The method of case study is a valuable tool for an in-depth research, where the research problem demands a deeper look at the case site. A case study is a type of research that is made for "on the field studies". A case study is a process of learning and researcher's own learning of the situation. In case studies, the primary source of data is usually gathered through interviews (Denzin & Lincoln 1998b).

In a case study, the researcher can enter the case site without possibly knowing important variables that will affect the research. This means that the researcher may have to go back to previous phases in the study (Denzin & Lincoln 1998b; Martella 1999).

A single-case study should be a detailed and focuses look on the case site and its individuals. The picture of the case site will get clearer as the research progress. Often single-case studies rely more on objective data collection methods. The researcher of a single-case should be careful when interfering the participants of the study in the case site. A single-case study emphasizes more on studying and understanding the case itself than a generalization that can be used in other similar cases (Denzin & Lincoln 1998b; Martella 1999; Soininen 1995).

The case study is chosen for this research as the research strategy, because of the goal of this research is to get an understanding of the case site and its actors. In addition, the research strategy is chosen for its iterative nature. This because when the researcher gets a better understanding there may perhaps be a need for going back to previous writing phases to adjust the thesis. The single-case research strategy is used, because the research focuses only on one particular study site.

Research Design

A research design is based on the empirical part of a research. To do the research design is to explain how the paradigm is connected to the empirical parts. The research design should also explain what is been and the strategy used for the study. In addition, a research design should describe the method and tools used to collect and analyses the collected data. A research design describes guidelines to connect the theoretical frameworks to the research strategy and data collecting method (Denzin & Lincoln 1998b).

Theoretical Frameworks

There will be used two frameworks in the research. The first framework is the framework based on the organizational theory. This framework will be used to collect and analyze the collected data. The second framework is the components of a computerized information system. These components will be used to categorize the factors that are found with the first framework.

Framework Based on Organizational Theory

For this research, the theoretical framework is based on the Organizational theory. Organizational theory is chosen for this research because of it nature and it suited this particular research. One important aspect of Organizational Theory is that it looks at the organization as a whole. Another aspect is the perspective of the organization that Organizational theory focuses on.

The researcher for this research has implemented the Organizational theory with 9 steps. The steps are drafted from the organizational theory itself and the purpose of the theory. Like in the first step of the framework "Look at the organization as a system with task roles", the theory sees the organization as a system with actors that have a task role.

In the fifth step of the framework, the task roles must be defined. This is important to get an understanding of the organization as a system where everything is interlinked to each other. The second and third step is to get the general knowledge and understanding of the organization. The other steps are also taken from the organizational theory and its purpose when studying organizations.

- Look at the organization as a system with task roles.
- Organizational structure of the case site (decentralized, and centralized).
- Organizational culture of the case site.
- The organizational design.
- Define the task roles in the organization.

- Study the functions of the organization (Organization's environment, Technology and Internal processes that develop in an organization over time).
- Study how to increase the efficiency of the organization.
- Study how an organization, the actors within the organization and the environment affects each other.
- Study factors that should be taken into consideration when designing an organizational structure, culture to control, and coordinate the resources.

From the nine steps, seven are used in this research. The other steps can be used in future research. The steps 1-6 are used when collecting and examining empirical data. Step nine is used to analyze the empirical data.

The case site will be looked at as a whole, a system with different functions, relationships and task roles. Data of the culture of the case site will be collected. In addition, data of the case site's organizational structure will be collected and defined as a centralized or decentralized structure. This clear-cut definition of organizational structure is used because small organizations can lack a formal system and therefore cannot be defined like as larger organizations. In addition, this look at the organizational structure if it is centralized or decentralized structure, shows who has the power in the organization and gives a hint about the culture of the organization.

The rules, tasks and relationships in the case site will be examined. The shared values that control the interaction of the actors of the case site will be studied. The task roles of the actors in the case site will be identified and defined.

Because there is no objective in this research to design or develop the organizational structure or culture in the case site the aspects of organizational design will not be focused on. This step could perhaps be used when designing the computerized information system.

From the main three functions, the organization's environment, technology and internal processes that develop in an organization over time, the second function, technology, is studied. The first function of an organization will only be shallowly looked on. From the first function the organization's environment, only the key factors that concern the primary function of the case site will be examined. The limitation is set because of the limited time for doing this research and the relevance for this particular research. In addition, other limitation of resources makes it difficult to study the case site's environment, as thoroughly as it perhaps should be. The third function, the internal processes that develop in an organization over time, is excluded from this study also because of the limited time to conduct this research.

There is no emphasis set on the seventh step, if the computerized information system will have any effect on the efficiency or if it will even decrease the efficiency exciting in the case site. This is why the seventh step is not used.

The eight step in the framework is not used, this because of the limited resources to study the environment of the case site such as time and money. Study of the environment of the case site is a large task that cannot be performed in the set time for this research.

The last step, "to study the factors that should be taken to consideration when designing an organizational structure, culture to control, and coordinate the resources", will be used when analyzing the empirical data. These factors will be the suggestions what a designer should take into consideration when designing a computerized information system for a small organization.

Components of a Computerized Information System

Every factor found from the analysis of the empirical data will be categorized according to the components of a computerized information system. The categories to categorize the factors are:

- Software,
- Hardware,
- Database,
- Telecommunication.

The factors will be categorized into one of the four categories, by what category's design process the factor would affect. Some factors may be related to more than one category. In these cases, the researcher will choose the main category but also mention the other categories of the factor.

Strategy for Data Collecting

Interviews are a common way of collecting data in qualitative researches. Interviewing has become more common in the last century. Interviews are often used as a technique to conduct social studies and are kind of a special way of making conversation. Interviews are a good way of gathering empirical data in social studies like case studies. The interviewer has to design the interview and be explicit in the execution of it (Denzin & Lincoln 1998a; Gubrium & Holstein 2003).

Another common source of data for a research is documents. In addition, the arrival of the Internet has produced another source for empirical data to research. The data collected will be only on the directly or indirectly related to the primary function of the case site. The data concerning the secondary functions of the case site is not relevant for this research.

The main source of empirical data from the case site is from interviews. Secondary data of the case site is collected with documents and studying the Internet site of the case site. The interviews will be done with the actors that work at primary function of the case site. The documents used for this research will be collected from the case site. In addition, the case site's web sites will be studied.

Strategy for Interviewing

Interviews should be looked as a type of conversation. In an interview, it is important to be able to listen to the interviewee and ask question in a good manner. An in-depth interview is a way of open and direct interviewing (Crabtree 1999; Denzin & Lincoln 1998a; Soininen 1995).

The interviews for this research are going to be in-depth interviews. This is to make the interview more flexible, allows a better interaction with the interviewer and interviewee and to response to the new information with additional questions (Brewerton 2001; Crabtree 1999).

There are going to be guiding question for the interviews, but there is room for additional questions to deepen the collected data. There are some examples of questions that are used in the interviews with the actors in the case site.

- What is the role of the interviewee in the case site?
- What are the tasks of the interviewee?
- How do the collaborations between the actors work?
- How is the tasks and actors been managed?

The interviews for this research will be conducted through the telephone. Every interview is recorded. The recording is to be able to listen to the interviews later and analyze the data more clearly and with time. The main reason for doing the interviews through the telephone is the long distance between the case site and where the research is conducted.

Another reason of doing the interviews with telephones is to limit time that the interviewees and interviewer are bound to the interview process and to reduce the interference by the interviewer in the case site. This reducing of interference is according to Roger W. Shuy (Gubrium 2003) one of the advantages of doing interviews through the telephone.

The plan is to interview the two full time employees and the managing director of the organization. These actors are directly related to the primary function of the case site. Other actors in the case site or from the organization's environment will not be interviewed. The reasons for this are the boundary set on this research and the focus that is set on the primary function of the case site.

With the steps 1-6 of Organizational theory framework, the question for the interviews will be constructed. The case site will be looked as a whole with interlinked task roles, with a focus on the primary function of the case site. In addition, the organizational structure and culture of the case site will be studied. Because the organizational design is irrelevant for this research, the step will not be studied. The task roles of the actors that are involved with the primary function of the case site will be defined. In addition, the relevant and obvious data of the environment that is related with the primary function of the case site will be collected.

Strategy for Analysis of Data

The usual methods for analyzing organizations were not adequate to answer the research question. These analysis methods studying the organizations are from different perspectives than what is needed for this research.

The empirical data collected from the interviews and the documents and website will be analyzed with the theoretical framework. The analysis of the empirical data will be done with the last step of the Organizational theory's theoretical framework. "Study factors that should be taken into consideration when designing an organizational structure and culture to control and coordinate the resources".

In this research, the factors that will be found and analyzed are the issues that could be significance when redesigning the structure and/or culture of the small organization. Designing and redesigning a computerized information system for an organization means that the designer redesigns also the structure and culture of the organization.

By analyzing the empirical data, the factors that should be taken into consideration when designing an organizational structure and culture to control and coordinate, and the resources are identified. The factors will be listed and transformed into general factors for small organizations rather than case specific factors. This is because the result of this research will not be bounded to just one case site but to be a more generalized result for small organizations.

The factors found with the last step, will then be categorized with the four categories. These four categories will link the factors to the components of a computerized information system. What of the four categories the factor affects choose the categories? A main category is chosen for each factor by the researcher's view. In addition, the secondary categories that the factor would affect.

Validation and Reliability

In a qualitative study, the issues of validation and the reliability of the results are not as important as in quantities studies. The measurement for checking the validation and reliability in studies are often designed for quantitative studies and may have no very relevant for a qualitative study (Martella 1999).

The validation on a qualitative study is often relative to the purpose of the study and environment of the case site. The data and the results a research is dependent on the researcher's Weltanschauug. (Checkland & Scholes 2000) This means that every researcher will have a different view on the case and the collected data and the researchers will have different results and interpretations of the same study (Martella 1999).

According to Maxwell (Martella, 1999) there are nine ways that the validity a research can be confirmed:

- To describe how the ethical attitude of the individuals in the case site was managed.
- To describe the case site and analysis and also the logic and the theoretical bases of the categorizations of the collected data.
- To describe of the situations that can challenge the result of the research.
- To collect data from more than one source.
- To describe the way the data has been checked.
- To describe the interpretations of the collected data has been formulated.
- To describe how the effect of value judgments has been limited.
- To describe how the theoretical framework is linked in the study.
- Make a description of the limitations that has been set in the research.

To show the reliability of a study there are some methods that can be used. One method is to describe the methods and logic that are used for the research. Another method is to collect data from different sources. To show reliability the research question should be clearly stated and be connected to the research design (Martella 1999).

"Did the individual change as a result of what I did/observed, or was the change due to something else?" (Martella 1999, p. 38), is the question internal validation primarily tries to take in consideration. Irrelevant variables are a concern for researchers and the information they gather, and it is important to be aware of these unnecessary variables when conducting a study. One way is to lower the effect of irrelevant variables that can affect the result of a study is to limit the variables studied in the research (Martella 1999).

The test the eternal validity of a study it should look on how the outcome of it can be generalized. To achieve external validity is especially important for studies that want to apply the result from theory to a general practice. Even if a study has, only a limited external validity does not diminish the study, because many basic studies have little relevance to the practice. For further studies that want to transfer the result of basic study to practice, the external validation has more importance (Martella 1999).

The validation methods that will be used in this research:

- To describe the case site and analysis and also the logic and the theoretical bases of the categorizations of the collected data.
- To describe of the situations that can challenge the result of the research.
- To collect data from more than one source.
- To describe the interpretations of the collected data has been formulated.
- To describe how the theoretical framework is linked in the study.
- Make a description of the limitations that has been set in the research.

By clearly explaining how the research is design and performed, the reliability of this research is displayed. In this research, the external validity cannot be confirmed because of the nature of the research. Even if the research tries to give a generalized result – a single-case study cannot achieve a comprehensive external validity.

Sampling

With sampling techniques, a researcher can reduce the data to collect by limit the collection from a smaller group rather than from the whole case. When choosing actors in the case site to interview there is no reason to interview everybody only a sample of the case site (Saunders, Lewis & Thornhill 2000).

The sample of this research is mainly chosen from the primary function of the case site. The data from the case site that is collected is data that is directly connected with the primary function of the case site. The secondary functions of the case site are not studied because they are not relevant of the primary function.

The interviews are done with the actors that are directly associated with the primary function of the case site. Because there are only three actors working directly with the primary function of the case site, all three are interviewed for this research.

Empirical Data

The empirical data for this research is collected from couple of different sources. The primary source of data is collected from interviews with the actors in the case site. The interviews are done only with the actors that are directly involved with the consultation operation, which is the primary function of the organization. Additional empirical data are collected from the case site's web pages and from the organization's memorandum of association and Trade Register.

For this research only the primary function – the consultation services is studied. This is because it is the focus in the case site and where the problem lies.

ANALYSIS OF EMPIRICAL DATA

The analyzing of data collected in a qualitative research may be hard and challenging. Often the analysis is an iterative process and gathered data will reflect to the whole study (Crabtree 1999).

The empirical data will be analyzed according to the last step of the theoretical framework. From the empirical data the factors that should be taken to consideration when a computerized information system is designed to the case site is analyzed. Firstly is the findings found from the empirical data explained. Then the case specific findings will be shown as more generalized factors for small organizations.

The factors that are found from the empirical data will be categorized with the categories.

Case Site – ABC Ltd

In some projects, the case site works closely with the customers. This should be taken into consideration in a computerized information system design for the case site.

Because the bio analyst works mainly from home, a computerized information system for the case site must be able to be accessed from the actors' home via an Internet connection. Also new potential actors could perhaps be hired from the distant -like from other parts of the country or world - and they could work through and managed by the computerized information system.

The case site does many consultation projects simultaneously; this means that a potential computerized information system must be able to handle many projects at the same time. The managing director is aiding the bio analyst and perhaps in the future new actors. A computerized information system should maybe have some kind of solution to support this tutoring through the network. A computerized information system should not deprive time from the managing director or other actors, especially the managing director who is already overloaded with tasks. The case site tries to hire new actors to the consultation service. For this reason, computerized information system must be able to handle potential new actors.

The managing director is managing the whole organization, and a computerized information system should support the centralized structure of the case site. The different tasks that the actors perform should be supported in a potential computerized information system in the case site.

The consultation projects are within the medical field. For this reason, a computerized information system must take into consideration the patient protection laws and other relevant laws.

The factors listed that are found in the analysis of the empirical data from the case site. The factors are not listed in any order of importance and are generalized.

- In many organizations, remote work is common and perhaps necessary. In addition, the fact that there are perhaps not suitable actors, in the region where the Organization situated, makes it necessary for the organization to get actors from other places. A remote computerized information system will be useful for these actors located far from the organizations location and compose "a virtual organization".

- A computerized information system is important to support the legislation, both the rules of the organization and the surrounding environment. Like in the case site where they work with information of patients so they have to protect the right of the patient according to the patient rights legislation of Finland

- Almost every organization wants to grow and to develop to make it in the competitive world. This is why a designer should consider the factor when designing a computerized information system.

- Also new actors could be introduced into the organization. These factors (3. and 4) suggest that it is important for a computerized information system to be flexible and able to handle changes in the organization. This flexibility can increase the computerized information systems lifespan in the organization.

- In a small organization, there is perhaps not a local network but the Internet is used. This makes it perhaps important for a computerized information system in a small organization to work via the Internet. In addition, to support the first factor -support remote work -the computerized information system should be able access through the Internet.

- Organization can have a close relationship with their consumers and partners. This can make it necessary for a computerized information system to able to be accessed by the consumer or the partners of the organization to handle for example common projects.

- It is not uncommon for organizations to do many projects and task at the same time. A computerized information system should be able to support simultaneous projects and tasks done with it.

- Every organization has a different organizational structure. Like in the case site, the organizational structure is in nature a centralized structure and a computerized information system should try to support the existing structure of the organization. This is that the organization does not need to redesign the completely organizational structure and culture to support the computerized information system.

- A computerized information system should be supporting the tasks of the actors of the organization and making it more efficient to do the task. If the computerized information system is to complex and time consuming to use it will perhaps not achieve this set goal.

- In every organization there are similar or dissimilar tasks done, this is because of the difference of the organizational culture and structure in organizations. Every actor and organization has their own way of performing these tasks. A computerized information system for a specific organization should perhaps try to support the organization's way of performing these tasks.

CATEGORISATION OF THE FACTORS

The factors found in the analysis are categorized, to the categories by the components of a computerized information system. The categories chosen for each factor with the number that is in the following list of categories. The main category for each factor is bolded. The secondary categories are regularly numbered.

The categories: a) Software, b) Hardware, c) Database, d) Telecommunication.

1. **Support remote work**: The main category for this is the telecommunication. Remote work is done through the telecommunication. These secondary categories can also be found for the other nine factors.

2. **The legislation the main category for this factor is software**. The software must be done so that is supports the legislation for example on what data can be gathered.

3. **Support the possible growth of the organization**, factor chosen category is the software. The software must be designed so that new actors, projects and such can be introduced into the organization.

4. **Support new actors:** This factors category is related to the previous factor so the category and the reason are the same.

5. **Access via the Internet:** The last category is chosen as the main category for this factor. Telecommunication is the part that this category affects.

6. **Able to introduce the customers into the system:** The database of an information system is affected by this factor. The database should be designed such that changes can be made to it.

7. **Able to handle many simultaneous projects:** The software is the category chosen for this factor. To apply this factor the software must be design such that it supports many projects performed at the same time.

8. **Support the organizational structure of the organization (like centralized structure)**: The main category chosen for this is the software. The factor affects the software of a computerized information system if it is used.

9. **Not time-consuming to use**: The chosen category for this factor is software. The software should be easy to use, easy to learn and not too complex.

10. **Support the performed tasks (both cultural and structural):** The main category for this factor is the first category: the software. Software should support the task performed in the organization, such as the projects and planning.

CONCLUSION

The research question, – "What are the factors that should be taken into consideration when designing a computerized information system for a small organization?" - For this research is tried to be answered, with a list of the factors. The factors are not conclusive, but only suggestions for a designer that what should be taken into consideration when designing a computerized information system for the case site. This research has tried to raise factors that could perhaps help designers to design a computerized information system for a small organization. Most of these factors are applicable for any small organization, while some of them are more specific for different kinds of organizations (e.g. "remote work" and "access over the internet").

DISCUSSION

There could be some aspects and perspectives that are not focused on and represented in this research. Because some of the customers of the case site work closely with the case site, this could have been focused more on. In addition, a more thorough study of the environment of the case site could have perhaps offered a deeper understanding of the case site and its situation. Also to get a better understanding of the case site, the tasks and projects could be looked on more, but because the goal of this research was to get a general list of factors to small organization a more thorough look of a specific organization was not seen as a necessity.

This research and its findings are only the researcher interpretation and the view of the case site and the empirical data collected from it. Another researcher could probably study the same research question in a different way, but that is the case in almost all qualitative studies. The research is done as a qualitative research and the goal has not to try to achieve an external validity, but the outcomes are for the specific case site.

FURTHER RESEARCH

One reason for choosing the theory used in this research, Organization theory, is that it is usable for future research. To confirm or dismiss the finding in this research, a similar case study would be good to do in another small organization. A further research could also study additional factors or specify the factors found in this research, with the aspects and perspectives that is not focused on in this research, such as the case site's environment. When and if the case site designs and implements a computerized information system, a research could be conducted for if the system has helped with the effectiveness of the case site.

REFERENCES

1. Brewerton, P. M. (2001). ***Organizational research methods: A guide for students and researchers.*** London: Sage Publications Limited.

2. Cameron, E., & Green, M. (2004). ***Making sense of change management: A complete guide to the modeling, tools and techniques of organisational change***. London: Korgan Page Limited.

3. Checkland, P., & Scholes, J. (2000). ***Soft Systems Methodology in Action***. West Sussex: John Wiley & Son Limited.

4. Cole, G. A. (1996). ***Management theory and practice*** (5th Ed.). Gosport: Ashford Colour Press.

5. Crabtree, B. F. (1999). ***Doing Qualitative Research*** (2nd Ed.). Thousands Oaks: Sage Publications.

6. Denzin, N. K., & Lincon, Y. (1998a). ***Collecting and Interpreting Qualitative Materials***. Thousands Oaks: Sage Publications.

7. Denzin, N. K., & Lincon, Y. (1998b). Strategies of Qualitative Inquiry. Thousands Oaks: Sage Publications.

8. Denzin, N. K., & Lincon, Y. (1998c). The Landscape of Qualitative Research: Theories and Issues Thousands Oaks: Sage Publications.

9. Druckman, D., Singer, J. E., & Van Cott, H. (1997). ***Enhancing organizational performance.*** Washington (D.C.): National Academies Press.

10. Gubrium, J. F., & Holstein, J. A. (2003). ***Inside Interviewing New Lenses, New Concerns.*** Thousands Oaks: Sage Publications.

11. Johnson Jr, B. L. ***Educational institutions and leadership through the lens of organization theory***. Emerald Group Publishing Limited.

12. Johnson, G., Scholes, K., & Whittington, R. (2005). ***Exploring Corporate Strategy;*** (7th Ed.). Essex: Pearson Education Limited.

13. Jones, G. R. (1995). ***Organizational Theory: text and cases.*** Inc, US: Addison-Wesley Publishing Company.

14. Koontz, H., & O'Donnell, C. (1984). ***The Principles and Practice of Management*** (Longman).

15. Laudon, K. C. & Laudon, J. P. (2004). ***Management Information Systems: Managing the Digital Firm.*** (8th Ed.). New Jersey: Pearson Education Inc.

16. Martella, C. (1999). ***Research Methods: Learning to Become A Critical Research Consumer.*** Ally & Bacon, Needham Heights.

17. Mintzberg, H., & Quinn, J. B. (1996). ***The Strategy Process: Concepts, Contexts, Cases*** (3rd Ed.). New Jersey: Prentice Hall Inc.

18. Olson, G. (2001). ***Coordination theory and collaboration technology***. Lawrence Erlaum Associates Incorporated.

19. Pugh, D. (1990). ***Organisational theory: Selected readings*** (3rd Ed.). Penguin.

20. Robbins, S. P. (1996). ***Organizational Behavior: Concepts, controversies, Applications.*** Prentice-Hall International, Inc, New Jersey

21. Salaman, G. (2001). ***Understanding Business: Organizations***. London: Routledge.

22. Saunders, M., Lewis, P., & Thornhill, A. (2000). ***Research Methods for Business Students***. Harow: Pearson Education Limited.

23. Soininen, M. (1995). ***Tieteellisen tutkimuksen perusteet.*** Turku: Painosalama Oy.

24. (1991). ***Medcare Ltd's Memorandum of association*** (Helsinki).

25. (2004). ***Medcare Ltd's Trade Register.*** Helsinki: National Board of Patents and Registration of Finland.

26. Checkland, P., & Holwell, S. (1999). ***Information, Systems and Information Systems.*** Retrieved from http://www.imprint.co.uk/C&HK/vol6/check-review_6-4.PDF(22.5.2006)

27. COTCOS. ***Organisational Theory.*** URL: Retrieved from http://wwwsv.cict.fr/cotcos/pjs/TheoreticalApproaches/Organ/OrganIntro.htm(12.12.2005)

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ROLE OF ICT IN INDIAN RURAL COMMUNITIES: AN OUTLOOK

Dr. P. Saritha[11]

ABSTRACT

The paper discusses the need to focus on Indian rural communities to empower them to access information, knowledge and poverty alleviation among them by deploying the ***Information and Communication Technologies (ICTs)***. Analyses the factors preventing rural communities from reaping the benefits of ICTs, Indian initiatives to overcome the factors, ways and means of poverty alleviation and sustainable development; identifies the bottlenecks and solutions, and lessons learned.

KEYWORDS

ICT, Rural Communities, Rural Area etc.

INTRODUCTION

Information is the key to democracy. With the advent of Information Technology (IT), it has become possible for common man to access global information. Information in a broader sense includes oral communication, voice in telephony, text in fax and newspapers, images in video and television broadcasting, and data in computers. All information can be digitized, transported, stored, retrieved, modified and then distributed. Emerging digital techniques, new network alternatives including intelligent networks, high bandwidth communication technology and state-of-the-art software for network functions and services, are the new technology trends evident in the development of electronic communication systems. The swift emergence of a global "information society" is changing the way people live, learn, work and relate. An explosion in the free flow of information and ideas has brought knowledge and its myriad applications to many millions of people, creating new choices and opportunities in some of the most vital realms of human endeavor. Yet most of world's population remains untouched by this revolution.

ICTs broadly cover the set of activities that facilitates capturing, storage, processing, transmission and display of information by electronic means. India is emerging as a testing ground for new technologies and business models that aim to narrow the digital divide. Limitations in electricity, telephony, Internet connectivity and other kinds of basic infrastructure in India's ***rural areas*** are a key challenge for a number of development organizations. The corporate sector too is discovering that bridging this digital divide could translate into new market opportunities. A number of innovative experiments already under way indicate that achieving global digital access and jump starting development may not be as difficult as many think. More than fifty grassroots projects in India are using modern ICTs for the benefit of urban and rural citizens. In the long run, rural ICTs projects could prove to be the most effective means of driving changes in rural areas: (i) ***Socially***: by ensuring equal access for less privileged groups; (ii) ***Economically***: by creating new kinds of work and financial transactions; and (iii) ***Politically***: by improving the quality, speed and sensitivity of state apparatus to the needs of local citizens. The success of a rural networking initiative depends on how far it progresses down the stages of IT and information diffusion: initiation, adoption, adaptation, acceptance, regulation and infusion. Creating information-rich societies is a key element of poverty alleviation and sustainable development. To empower poor people and to reduce digital divide, ICTs projects should be developed in local language prioritizing local needs and content; be a model of low cost solution so that poor people can replicate this model or can own or share the system; be owned and participated by community in general; be sustainable in long terms; be able to adopt and utilize innovative ICTs; and be supportive to local and public access points as in rural areas where divide is the widest. A national agenda on a ***C-8 thrus***t towards: Connectivity ***provision***, Content ***creation***, Capacity ***augmentation***, Core ***technologies'*** creation and ***exploitation***, Cost ***reduction***, Competence ***building***, Community ***participation*** and ***Commitment*** to deprived and disadvantaged would definitely help in meeting the socio-economic aspirations of ***rural communities***.

NEED TO FOCUS ON INDIAN RURAL COMMUNITIES

Even after 57 years of India's independence, the country is still facing pressing problem in dealing with its rural poor and how to increase their income level. The rural-urban distribution of population in India and select states is provided at table 1 (Census of India, 2001). Out of 1027 million (102.7 crore) population, 742 million (72.2%) live in rural areas and 285 million (27.8%) in urban areas. The rural populace are living in 600,000 villages spread over 27.60 lakh sq. km, across India with very poor or no infrastructure like roads, transport, power supply, clean drinking water, healthcare, education system, communication network, etc., further pushing them to poverty.

According to India's first Social Development Report a large proportion of Indians are still below the poverty line: 26% or about 260 million. The poverty is increasingly concentrated in a few geographical locations and among specific social groups. The

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incidence of poverty as per 1999-2000 figures, Punjab state has the lowest of 6.16%, followed by Haryana at 8.74% and Kerala at 12.72%. Orissa state has the highest incidence of poverty of 47.15%, followed by Bihar at 42.60% and Assam at 36.09%. Though, poverty levels have shown a decline, there is huge disparity among social classes with percentage of the poor among Scheduled Tribes being 43.8, Scheduled Castes 36.2 and Other Backward Classes 21.

Table-1: Rural-Urban Distribution of Population – India and Select States

India/State/ Union Territory*	Population			% Rural Population
	Total	Rural	Urban	
India	**1,027,015,247**	**741,660,293**	**285,354,954**	**72.22**
Jammu & Kashmir	10,069,917	7,564,608	2,505,309	75.12
Punjab	24,289,296	16,043,730	8,245,566	66.05
Delhi*	13,782,976	963,215	12,819,761	6.99
Uttar Pradesh	166,052,859	131,540,230	34,512,629	79.22
Bihar	82,878,796	74,199,596	8,679,200	89.53
Assam	26,638,407	23,248,994	3,389,413	87.28
West Bengal	80,221,171	57,734,690	22,486,481	71.97
Orissa	36,706,920	31,210,602	5,496,318	85.03
Madhya Pradesh	60,385,118	44,282,528	16,102,590	73.33
Maharashtra	96,752,247	55,732,513	41,019,734	57.60
Andhra Pradesh	75,727,541	55,223,944	20,503,597	72.92
Karnataka	52,733,958	34,814,100	17,919,858	66.02
Kerala	31,838,619	23,571,484	8,267,135	74.03
Tamil Nadu	62,110,839	34,869,286	27,241,553	56.14
Pondicherry*	973,829	325,596	648,233	33.43

Sources: Authors Compilation

Mass poverty is affecting India's ability to compete against countries with better physical infrastructure for connectivity, informed citizenry and more educated population for foreign direct investment that India needs to face a fiscal deficit. With its current rate of growth, existing work culture and policies, it would be difficult to keep pace for poverty eradication, until government redefine its policies and strategies dramatically, apply ICTs innovations with application and active participation from private sector, Community Based Organizations and Non-Governmental Organizations. When India tries to push its growth to 8-10% in the next ten years, lives of the poor would remain visibly unchanged. Even in the best-case scenario, per capita income in India would rise from the current US $ 300 per year to all of US $ 500 per year a decade from now.

ICTs Role in Rural Communities

ICTs play a major role in a nation's politics, economy, social and cultural development. These fuel the global economy and relate to human rights, helping at best, to support freedom of expression and right to information according to Article 19 of the Universal Declaration of Human Rights. About 1.2 billion people are experiencing extreme poverty that is considered by many to be the worst human rights violation in the world. Consequently, the global development community has endorsed in the United Nations' Millennium Development Goals its commitment to halving the number of people living under one dollar a day by 2015. The paper presents that ICTs, if supported with right policies, crosscutting and holistic approaches, will complement and strengthen other multi-sector efforts that are required for poverty alleviation. It is essential to define ICTs, before discussing the issues further.

ICTs broadly cover the set of activities that facilitates capturing, storage, processing, transmission and display of information by electronic means. The Organization for Economic Co-operation and Development (OECD) (2002) defines ICTs sector as a combination of manufacturing and services industries that capture, transmit, display, data and information electronically. This definition makes a useful distinction between manufacturing and service dimensions of ICTs and paves way for understanding multi-dimensionality of ICTs and its applicability to help reduce poverty across various sectors. The service role of ICTs can enhance rural communities opportunities by improving their access to market information and lower transaction costs (for poor farmers and traders); increase efficiency, competitiveness and market access for developing country firms; enhance ability of developing countries to participate in the global economy and to exploit their comparative advantage in factor costs (particularly skilled labors); health and education. Furthermore, ICTs can promote greater transparency, speed-up decision-making process of governments and thus empower rural communities by expanding use of government services, and reduce risks by widening access to microfinance. However, barriers to access, high costs and minimal human resources often prevent those living in poverty in reaping the benefits. When private and civil sectors work together as partners, benefits of ICTs can be greatly enhanced, returns to the community improved and profits increased.

FACTORS PREVENTING RURAL COMMUNITIES TO REAP BENEFITS FROM ICTS

There are a number of important factors preventing rural communities in developing countries from reaping benefits of ICTs. Without developing access models that can address these factors, rural masses will be left far behind urban dwellers closer to digital opportunities. Deploying ICTs to empower poor and lead them to the road of prosperity can be achieved through poor-oriented governmental policies rather than corporate-oriented. The constraints are:

Lack of Awareness about Benefits of ICTs

Despite growing number of people who own a computer and have Internet access, most people in developing countries have little opportunity to connect to the Internet. They are unaware of socio-economic benefits and stimulus to good governance that ICTs can bring. The quasi-absence of demonstration projects in some countries, very limited information is available to assess and to advocate the impact of ICTs for development.

However, India has a strong and fast growing IT industry; access to ICTs remains very low, particularly in rural areas. The present indicators of IT penetration in Indian society are far from satisfactory. PC penetration is 1.21% (China with 4.08%, Asia at 6.39% and world average at 9.63%). The installed base of computers is more than 13 million (ITU, 2005b). To demonstrate awareness and impact of ICTs among people, projects such as Hole-In-The-Wall Training System for slum area boys and girls who has no knowledge of English and World Corps for imparting technical and business skills that promote employment such as Internet centres to economically poor, are already functioning.

Lack of Access Facilities

The access facilities mainly comprise computers and connectivity in rural areas. The Internet and computer are expensive to be accessible to ordinary citizens. It is often available only in urban centers, where most Internet Service Providers (ISPs) have their market.

Despite the ongoing deregulation of India's telecommunications sector, its national tele-density is one of the lowest in the world at 8.44. The Department of Telecommunications, India has set a target tele-density of 22 by 2007 by observing the increasing trend of 11.4 in 2005 due to mobile boom. The Internet arrived in India during 1995 for public use through Videsh Sanchar Nigam Limited. The current Internet subscriber base is 3.24%, in sharp contrast to Asian countries as Korea with 65.68, Malaysia with 38.62 and China with 7.23% (ITU, 2005b). At present, there are 390 ISP license holders, 64 in Category 'A' and 135 & 191 each in Category 'B' and 'C' and the operational ones are 189. The Indian government has been propelling towards "Information Age" and "Convergence" with an ultimate goal of "Internet for All". However, implementation has been beset with various operational, procedural, regulatory issues and supporting legal framework that is inhibiting reach and benefit of the Internet to masses in the country.

To achieve "IT for All by 2008", India Society for Electronics & Computer Technology has setup 4000 multipurpose IT centres in rural and tribal areas in 29 states of India through 4500 training centres. It provides a variety of training and servicing modules in Indian languages and nurturing entrepreneurship in electronics and IT. It enrolls 150,000 students each year for courses covering school to university level and includes a special training programme for women. Further, a National Centre for Electronics and Information Technology has been set up to support and continue the programme.

Language Barriers in using the Internet

These prevent people from familiarizing themselves with benefits of Internet based information resources that invariably require an ability to understand international languages, especially English. As a result, most people in developing countries cannot read and understand most of the Internet content. Another factor is high illiteracy rate among rural people.

In India, adult literacy rate is about 58.8% and female literacy rate is about 47.3%. There are 18 languages officially recognized, each having a different character set. About 66% of Indians speak Hindi and less than 5% of Indian population understands English. Realizing the need to overcome language barrier and offer IT to the masses in their own language, the government initiated a Language Technology Mission to make available these software tools and fonts in the public domain. The Centre for Development of Advanced Computing has developed these, initially in Tamil, Hindi and Telugu languages. Similar efforts are in progress to develop software tools, utilities and applications in other Indian languages. HCL has taken leadership initiative to preload this revolutionary offering across all its PC brands.

Lack of Local Language Information Products

Lack of suitable information products tailored to the needs and assimilation capacities of rural people in developing countries. In order to better, adjust their investment decisions people need updated information on market prices, new agricultural technologies and methods to raise quality of their products, adapt to changing climatic conditions or demands of agricultural markets.

Several projects successfully generated and made available locale specific information on network in the native languages including weather information, entitlements to rural families, prices of agricultural inputs, etc., in Information Village Research and poor people's innovations and traditional knowledge visibility through a multimedia and multi-language database of solutions to local problems in Honey-Bee Network etc.

Non-availability of Government Information through Online

Most countries do not have pro-poor ICT policies and plans to reorient relevant government institutes as electronic service providers to boost rural development. The efforts of providing government information in the form of improving administration of land records, caste certificates, health services, information on government programmes, online public grievance redressal; etc., has tremendous success at Wired Villages of Warana and government-to-citizen e-commerce activity at the doorsteps of beneficiaries in Gyandoot.

Lack of Motivation to use Information over the Internet

In spite of connectivity, people will not use ICTs unless they are motivated to do so. Community ownership of access facilities and availability of facilitator are key factors to induce motivation.

In TARAhaat, the in-built motivation has empowered people to eliminate intermediaries in marketing their produce directly over network, online services to several rural communities and consumer-to-consumer, and e-choupal has successfully bridged the gap between rural community and buyer, to increase income level of farmers.

INDIA IN THE CONTEXT OF ICT

India is emerging as a testing ground for new technologies and business models that aim to narrow the digital divide. Limitations in electricity, telephony, Internet connectivity and other kinds of basic infrastructure in India's rural areas are a key challenge for a number of development organizations. The corporate sector too is discovering that bridging this digital divide could translate into new market opportunities. A number of innovative experiments already under way indicate that achieving global digital access and jump starting development may not be as difficult as many think. More than fifty grassroots projects in India are using modern ICTs for the benefit of urban and rural citizens. In the long run, rural ICTs projects could prove to be the most effective means of driving changes in rural areas: (i) *Socially*: by ensuring equal access for less privileged groups; (ii) *Economically*: by creating new kinds of work and financial transactions; and (iii) *Politically*: by improving the quality, speed and sensitivity of state apparatus to the needs of local citizens. The success of a rural networking initiative depends on how far it progresses down the stages of IT and information diffusion: initiation, adoption, adaptation, acceptance, regulation and infusion.

ICTs Enhances Access to Information and Communication

Spreading the telecom revolution to rural communities of India, Grameen Sanchar Seva Organization (GRASSO) established in 2001, intends to establish physical, electronic and knowledge connectivity for economic development of rural population. It deploys 7,000-strong network of self-employed people riding out on bicycles, carrying mobile phones equipped with CDMA WLL into 5,000 West Bengal villages. These men get profits from all calls made while bringing telephone services to villages for the first time. GRASSO made it possible the mobile phone reach to 93% of West Bengal's 34 Blocks, 46% of its Gram Panchayats and 14%t of its villages. Further, in association with Microsoft, IBM, Wipro and TCS, GRASSO intend to setup 500 common service centres (CSCs) in the state's 3,357 Gram Panchayats. Each CSC acts as hub for about 20 services, ranging from electricity bill payment, tea and coffee to commodity trading, warehousing and cold storage. The plan is to have 3 phones in each Panchayat, totaling 12,000 phones, resulting in 100% telephone coverage. The idea is to use telecom and IT to strengthen distribution network of agricultural produce and make it more profitable.

Infothela initiated in January 2002, to deliver information and spread knowledge at village level where fruits of modern technology have not reached yet. The unit is a pedal driven vehicle like a common cycle rickshaw but with a PC having Internet access through wireless technology on board. An added pedal generator is designed to recharge the battery pack that powers computer while the vehicle moves from village to village. The unit serves a variety of purposes including education or entertainment applications, providing agricultural, weather and government information. Further, it accommodates diagnostic testing equipment's like blood pressure, blood sugar, some other primary health diagnostic and testing equipment's. Infothela was designed as a self-sustaining project and generate a self-employment avenue for urban and village populations.

Sustainable Access in Rural India was initiated in November 2001 to demonstrate that creation and deployment of information and communication services and technologies in poor rural areas lead to improvements in health, empowerment, learning and economic development amongst the poorest and most disadvantaged communities. Initially, it provided Internet access and applications through 1000 connections in 350 villages in Madurai District of Tamil Nadu. SARI was later extended to 10 more districts and renamed as RASI (Rural Access Services through Internet). Touch screen Internet kiosks were installed through public-private-partnerships in all Taluks of the state.

ICTs in Education

Increased and improved education through computers or about computers or both would contain the poverty in all fronts. There are several successful initiations to demonstrate the role of ICTs to promote education among poor and preventing poverty.

Hole-In-The-Wall Training System was initiated in 1999 as a minimally invasive education technology to incidental learning with minimum human guidance. It comprises of an unmanned, Internet enabled computer with a track ball housed in a slum area. The continuous monitoring of use of computer through video capture showed that young boys and girls from the settlement became highly proficient at using graphic interface and in surfing parts of the Web, regardless of their lack of proficiency in English, or the absence of any direct instruction. Thus, the experiment demonstrated that children, irrespective of their social, ethnic or educational identity, learn to use computers by themselves, thereby closing the digital divide. About 40,000 in-school and out-of-school children have been directly impacted. This technique is being made available to the world through Hole In the Wall Education Limited by NIIT (Kataria, 2005; World Bank, 2006).

Computer-based Functional Literacy Programme was launched in February 2000 in Beeramguda village in Medak district of Andhra Pradesh (AP) to combat illiteracy with a new approach to learning, using multimedia and flashcards to fortify learning experience. The lessons focus on reading, tailored to fit different languages and even dialects and are based on the theories of cognition, language and communication. The programme is currently operational in 1000 centres in several states of India and helped more than 20,000 people to read. Tata is of opinion that if implemented properly, the project can make 90% of India literate in 3 to 5 years.

Schoolnet India Limited was initiated in 1998, to support education infrastructure for enhancing the quality of human capital of India. K-Yan (vehicle of knowledge) is a low-cost new-media product for community learning that aims to bring benefits of information age to the masses across the country. Learnet India Limited is one of the leading e-learning service providers in the country, such as Learnet's Info Quest, Continuing Learning Management System, Assessment Online System, SchoolTrackTM, etc. Further, commendable work was done in the field of K-10 education, the content of which is curriculum-mapped to identify different teaching aids.

ICTs in Economic Interventions/Entrepreneurship

ICTs play an important role in direct poverty alleviation by enhancing activities of poor and increasing their productivity by way of new credit and financial services, new opportunities to design, manufacture and market products through the Internet or intranet systems, etc. These interventions can be successful only when accompanied with other supporting infrastructure consisting of access roads, storage facilities, competitive markets and opportunities to global market. The impact of select projects demonstrates various levels of reducing poverty.

ITC's e-choupal was initiated in June 2000 and empowers farmers with expert knowledge by innovatively leveraging IT. It regards poverty, farming and rural livelihoods as interrelated issues. It provides farmers real time access to customized knowledge on specifically designed Web sites in their own languages and helping them align farm output to market demands and secure better quality, productivity and improved price recovery by eliminating middlemen. It has enabled over 3.5 million farmers to lift themselves out of poverty through 5,250 e-choupals in 31,000 villages in 6 states of India. The empirical analysis of the impact of e-choupal shows that income from farming and support services rose by over 38% since 2000 and from farming alone rose by about 10% in 2004. Over the next decade, it plans cover 100,00 villages, representing 1/6 of India's villages to create more than 10 million e-farmers. The model has also generated various employment opportunities in central and northern India for rural educated youths.

Information Village Research was initiated in January 1998 and connected 10 villages near Pondicherry in southern India by a hybrid of wired and wireless network, consisting of PCs, telephones, radio devices and email connectivity through telephone lines. It empowered villagers to access necessary information to improve their lives, with involvement of local volunteers who gather information, put the information on an Intranet and provide access through nodes in the villages. The project uses local Tamil language, while the local communities have participated right from beginning with the project. Most of operators and volunteers are women, empowering them with both status and influence. Information provided in the village knowledge centres is locale specific and relates to prices of agricultural goods, market, community information, health care, cattle diseases, transport, weather, etc. The project is an inspiring example of how breaking the information barrier can change rural lives.

AsCent implements Kolhapuri, the traditional handcrafted footwear, emphasizing ethnicity and natural finish, by deploying computer aided design to enhance artisanal production of kolhapuri style of cheppals and hosts on the Web site. Motivation and enabling has made it possible for the artisans to promote their own signature brand ToeHold; become a fashion statement and all set to secure a foot hold in the global market, adding a whole range of new designs to the existing traditional ones. The artisans believe each of their SHG, formed as saving and credit affinity groups of 15 to 20 women, to be a tiny company and they will soon have a big company to take up all marketing and development activities. ToeHold Artisans Company will be the first grassroots women majority company.

ICTs in Health Programmes

There are many successful initiatives to demonstrate the role of ICTs to promote health of the poor and preventing poverty that originate from poor health by way of providing superior medical advice, diagnosis or knowledge in their locality.

Sisu Samrakshak initiated in October 2000, provides ICTs enabled child health care aimed at accelerating delivery of child development, health and protection services. Data is collected by using hand held devices and communicate it to nearest rural centers. It also, provides access to information on health, education, agriculture, water supply and sanitation, public services for economic and social development in rural and underserved sections of AP, India. The UNICEF plans to train and appoint from rural communities as anganwadi workers, frontline health workers and auxiliary nurse midwives, to monitor maternal health, nutritional development and childcare (Thompson & Khara, 2003).

Networked HIV/AIDS Intervention initiated in 1989 by Samuha uses ICTs and GIS technology for HIV/AIDS intervention and awareness program in Devadurga, Karnataka, India. Networked intervention cells offer outpatient services to afflicted persons, provide awareness, prevention counseling to vulnerable communities and serve as an interface with local community. The resultant effect would be that afflicted persons might enjoy wider community support.

To enable Government-run Primary Health Centres (PHCs) that serve medical needs of the rural population, George Foundation in 2000 co-managed Bagalur PHC comprising of 80,000 people in Tamil Nadu by deploying a computer software Early Detection & Prevention System 2000 that consists of a database of disease characteristics and conditions, and the logic to diagnose symptoms. It facilitates early detection of diseases and nutritional deficiencies among rural population. The foundation started its own Baldev Medical & Community Centre, to demonstrate how healthcare, health education and many essential rural community services can be delivered in a cost-effective way within a private model, serving a rural population of over 15,000 in 17 villages.

ICTs in Governance

ICTs facilitate improved access to government and quasi-government resources and services. Good governance ensures transparent use of public funds, growth of private sector, effective delivery of public services, rule of law, etc. It also facilitates pro-poor policies and foolproof macroeconomic management. The factors that have influence on denial of basic services to the poor are lack of investment, institutional structures that lack accountability, domination by local elites and well-to-do, widespread corruption, culturally and socially determined inequality, and lack of participation by the poor. The lack of systematic, transparent recording and public documentation of government data also affects poor, as in the case of land records. Without land records as collateral, poor cannot obtain loans and often cannot get assistance from government poverty alleviation programs intended for small farmers. ICTs aid to facilitate speedy, transparent, accountable, efficient and effective interaction between public, citizens, business and other agencies; promote better administration and business environment, and saves money in costs of transactions in government operations.

Drishtee was initiated as an organizational platform for developing IT enabled services to rural and semi-urban population through the usage of state-of-the-art software. It offers services including access to government programmes and benefits, market related information and private information exchanges and transactions. It uses a tiered franchise and partnership model. It aims to create 50,000 Information Kiosks all over India within a span of six years. These kiosks potentially serve a market of 500 million people. Drishtee has demonstrated its concept in over 90 kiosks across five Indian states within two years.

The Computer-Aided Administration of Registration Department (CARD) initiated in August 1996 in AP, India, deploys networked computers to reform the processes of registering deeds and stamp duties, and completes transactions in two hours. By traditional methods, this involves 13 steps in opaque process that involves bureaucratic delay and corruption, resulting a delay of 3-15 days. Annually, over 120 million documents need to be processed.

ICTs in Promoting Democracy

ICTs play a major role in supporting the culture of democracy, democratic processes and civic values that uphold a democratic system. Interventions in e-democracy involve processes on electronic interaction between government and citizens. The aim is to: provide for citizens access to information and knowledge about political process, services and available choices, and facilitate transformation of passive information access to active citizen participation by informing, representing, encouraging to vote, consulting and involving citizens. Thus, ICTs aid in creating well-informed and active citizenship, undermining closed and undemocratic regimes, and supporting watchdog role of citizen groups. Often the poor know their problems well, but they lack knowledge of larger socio-economic context of their poverty and various options to improve their situations. It is essential that development planners need to have direct contact with poor, to link development programs to realities.

Akshaya an implementation of Kerala State IT Mission, aims to set up a network of 6000 information centres that would be able to impart basic IT literacy to at least one member in each of the 6.5 million families of Kerala. It will also provide services like data entry, desk top publishing, computer training and Internet telephony; generate and distribute locally relevant content; improve

public delivery of services for networking and computerizing 1214 local self-governing bodies to expedite transactions like issue of certificates, licenses, tax collection, etc. The existing centres are also being tapped to serve as agri-business centres for providing more services to citizens such as agriculture related information and inputs to the farmers.

Baatchit initiated in November 2001, aims to facilitate Information access, communication, entertainment and socio-economic opportunities within villages, while promoting Indian heritage and cultural values. It empowers villagers by providing them with easily accessible information through iconic Baatchit Community Software. The priority areas are government, schemes, employment, animal, agriculture, banks, vehicle, health, and housing, transcribing into the local language, so that the literate villagers can understand the information being provided to them. Audio-visual presentation of the information helps the illiterate users.

OBSERVATIONS/LESSONS LEARNED FROM ICTS PROJECTS

The experience with ICTs projects in India is a mixed one and few projects fared well. While initiation and implementation of these projects, various perspectives have to be taken into account, viz. technological, organizational, economic and social.

The factors that contributed to the success of select projects are:

(i) For e-choupal – ease of replicability and scalability model, customization of technologies to meet specific local needs, organizational commitment to success, involving local community members for training and selecting one of them as a coordinator and infusing high trust by profit sharing between platform holder and beneficiaries;

(ii) For Information Village Research – community readiness to accept innovations, economic benefits, high trust among the community, inclusion of gender sensitivity to take care of women empowerment and assurance of equitable benefits to the participants;

(iii) For AsCent - intensive skill development efforts, high returns from new technology and reputation of implementing agency etc.

Most of the projects rarely publish and publicize about their activities, except few. With no comparative study or linking across projects, the lessons learned by one project are not transmitted to the others. Appropriate technologies are rarely evaluated and financial sustainability; scalability and cost recovery are seldom addressed. Hence, opportunities to learn from the diverse, creative experience remain unutilized. The scalability of ICTs projects depends on levels of transaction costs involved in operations of the project. The project plans frequently ignore harsh realities and very few have substance for implementation. Most of the projects are late and run into unexpected problems. Every state in India has an agenda on computerization of land records and most of the records are legally contested.

Economically responsible projects are already proving more successful than charitable or free models. Projects that identify and cost the services they provide are more successful. The sustainability of ICTs projects is high when external component of the project funding is of a reasonable level and the activities are sustainable. The Wired Villages of Warana was initially funded by the Maharashtra State and Central Government, is currently maintained by sugarcane cooperative in the area, and offers tangible benefits to sugar producers, and sugarcane growers. The presence and convergence of interests and expertise of existing corporate entities and beneficiaries enhance the chances of sustainability of ICTs projects. The E.I.D. Parry has set up a series of info-kiosks in villages, partly to provide better information to farmers about agricultural inputs, harvesting of sugarcane and other matters. Some projects disappear once the initial funding disappears, as the case of an Apple project for rural health workers in Rajasthan a few years back that was only recently taken up again by Computer Maintenance Corporation.

It is highly essential to initiate projects by consulting at grassroots level for their success - top down approaches do not work. These results in providing information that people do not really need or use; at an incomprehensible level of technical detail and terminology, or in a literary language that local people do not understand. An intimate understanding of the social and economic parameters of rural India gives connectivity providers a significant advantage. The initial information requirements may change over a period and therefore periodic assessment must to be undertaken. The systems for participation of beneficiary upfront enhance effective functioning of the ICTs projects, substantial benefits accrue to the poor only when beneficiaries are identified and involved at the project conceptualization stage. The successful projects are the ones that have regular review systems to assess the realization of benefits across different beneficiary classes.

The content creation in local language is a prerequisite for project success. It is imperative to develop locally relevant content in local language and to present it intelligibly as well as offering suitable and adequate training. In addition, the nature of local content varies from region to region. Without accessible, local content, that addresses the real problems of local people in their own language and in terms that they can understand, the ICTs projects are bound to fail. The radio programs, especially designed to appeal to ordinary people are more effective than computers in reaching people about topics like best agricultural practices, family planning services, etc., since about 100% of the Indian population has access to radio.

The scope of IT must be seen as reaching beyond that of just computers and the Internet to include radio, TV, microchip technology, etc. The use of automated butter fat assessment equipment, as part of the Akashganga project is a classic example.

The most promising uses of ICTs is in e-governance that involves two distinct activities: computerization of government functions (connecting state government headquarters to district officials, computerized registrations, land records, etc.) and provision of G2C and C2G connections through that citizens can obtain access to a variety of information (information about entitlements, access to records, rules, etc.). The Gyandoot Project makes available more than a dozen official documents that are legally valid if obtained from village cyber-kiosks under the right circumstances. The rural entrepreneurs and crafts persons are saving time, travel and effort. Greater benefits will be felt when wired micro-credit accounts come into use for online or distance transactions amongst or within village communities.

The creation of assets and training of people enhances the sustainability of ICTs projects. These projects work effectively when training is an inherent component of the project and skill development ensures rapid diffusion of innovation through interactions and communication.

ICTs projects have assisted rural communities by providing them with news, information, advice and knowledge that has hitherto been inaccessible to them. This information has allowed rural citizens/consumers to make more informed economic decisions: landless laborers have negotiated their daily wages more effectively; and tractors, threshers, old television sets, cattle and motorcycles have all been traded across towns and villages due to online advertisements. Until the cost of basic IT devices that deliver the 'last mile' of connectivity and local language software is lowered, the goal of wiring rural India will remain a dream.

BOTTLENECKS AND SOLUTIONS TO RURAL INDIA

The basic requirements for successful implementation of rural ICTs initiatives are electricity, hardware, appropriate software, telephony, network connectivity and policy guidelines:

- The electrical supply in many rural areas will be restricted to only 6 or 8 hours with varying voltage and frequency that are far outside the acceptable limits of hardware. Often grounding is not available. For most rural ICTs projects, battery back-ups, universal power supplies, solar power panels, circuit breakers and voltage stabilizers are necessary. Several hardware innovations are emerging in the country to function for 4 hours and more without recharging.

- On the hardware front, PCs remain expensive, fragile, quickly obsolete, English-centric and complex in operation. The human-mediated computer kiosks, shared among multiple users of a rural community, could in fact prove to be most inexpensive and inclusive form of rural infrastructure. This, means moving from a PC paradigm to a Community Computer (CC) platform. The investment on CCs shared by the citizen-consumers that it serves 500 to 2,500 every week. Thus, the hardware cost per capita reduces to miniscule. Further, a number of technology companies including Hewlett-Packard are developing products and services; PicoPeta Simputers developed a Simputer or Simple Computer for less than US $ 200, that can read a smart card, has advanced audio and text processing capabilities in several Indian languages; Via Technologies and Kanwal Rekhi School of Information Technology, IIT Mumbai jointly developing a rugged, low power consuming PCs for the rural India and other countries. These initiations can prove to help bridge the digital divide in emerging economies like India.

- On the software front, lack of standardization of code for major Indian languages creates inter-operability problems between programs involving distinct codes. Centre for the Development of Advanced Computing has been working on Indian language fonts and software for over a decade. Many rural ICTs projects use its font graphic standards or text-processing software. A machine language translation project, Anusaraka, promises to allow Indian language users translation between various Indian languages, as well as access to English language resources on the Web.

- Many villages lack landline telephones still. If they are available, they often go down for weeks at a time and may involve various kinds of incompatibilities that prevent data transfer. A wireless CB-radio-type system for relatively slow data transfers using fax protocols, VSATs that connected directly to communications satellites and telephone access in proximity to optical-fiber cable routes may be chosen as alternative means.

- The Internet subscriptions do not always cover rural areas and connectivity will be achieved by making long distance calls to nearby cities. This results in slow and unreliable access. New developments in the area of connectivity are providing optimism, viz. WLL systems are up-and-running in several districts across peninsular India from n-Logue service provider; private radio link installations that operate on 802.11 wireless protocol, demonstrated an operating range of up to 10 kilometers; prospects of mesh networks using either Bluetooth or one of the two wireless standards; WorldSpace, the satellite-radio broadcaster offers data and audio broadcasting capabilities, etc.

CONCLUSION

Creating information-rich societies is a key element of poverty alleviation and sustainable development. To empower poor people and to reduce digital divide, ICTs projects should be developed in local language prioritizing local needs and content; be a model of low cost solution so that poor people can replicate this model or can own or share the system; be owned and participated by community in general; be sustainable in long terms; be able to adopt and utilize innovative ICTs; and be supportive to local and public access points as in rural areas where divide is the widest.

A national agenda on a C-8 thrust towards: Connectivity provision, Content creation, Capacity augmentation, Core technologies' creation and exploitation, Cost reduction, Competence building, Community participation and Commitment to deprived and disadvantaged would definitely help in meeting the socio-economic aspirations of rural communities.

REFERENCES

1. Retrieved from http://www.adb.org/Documents/Policies/Poverty_Reduction/Poverty_Policy.pdf
2. Retrieved from http://www.ftpiicd.org/files/research/briefs/brief1.doc
3. (2001). ***Rural-Urban Distribution of Population – India and States/Union Territories: 2001***. Retrieved January 30, 2006 from http://www.censusindia.net/results/rudist.html
4. Katakam, A. (2002). The Warana Experiment. ***Frontline*****,** 19, 8
5. Retrieved from http://www.itcportal.com/newsroom/press_02july05.htm
6. Rao, S. S. (2002). ***Knowledge Management in India's Rural Community Projects.*** In Online Information 2002 Proceedings, pp. 29-38. Oxford: Learned Information
7. Retrieved from http://ci-journal.net/index.php/ciej/article/view/313/429
8. Retrieved from http://www.ci-journal.net/index.php/ciej/article/view/313/429
9. Retrieved from http://www.ci-journal.net/index.php/ciej/rt/printerFriendly/313/429
10. Retrieved from http://www.idra.it/garnetpapers/C06Sumanjeet_Singh.pdf

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CAREER MANAGEMENT, EMPLOYEE DEVELOPMENT AND PERFORMANCE IN INDIAN INFORMATION TECHNOLOGY ORGANIZATIONS

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ABSTRACT

Employee development, a major aspect of human development, is the process through which an individual's work identity is formed. It spans one's entire lifetime. Employee development is a powerful employee motivator and retention tool, not to mention a competitive strength when it comes to attracting new talent, all of which can have a profound impact on an organization' bottom line. Happy, satisfied workers are more productive and more likely to stick around when they believe their employers value them. Employee development is sponsored by an organization for its workers and focuses on identifying, assuring and helping evoke new insight through planned learning. This study investigates relationship between career planning, performance and employee growth and explores the alignment between individual and organization's career planning. Data was collected through a questionnaire, which was administered to 100 employees from five Indian IT companies followed by personal interviews.

It was found that career guidance, leadership roles, network building, developing new skills, taking up special assignments and receiving productive feedback from the boss play the most important role in making the career path easier and aids in the performance and employee growth. The paper discusses the results and implications for Indian IT organizations.

KEYWORDS

Career Planning, Employee Development, Employee Growth, Employee Performance etc.

INTRODUCTION

The business world is undergoing unprecedented change. Organizations functioning in this complex business environment are continuously engaged in restructuring and downsizing processes, facilitating mergers and acquisitions and embracing technological advancements to cope with the dynamic pressures of globalization. These changes at the organization level have elevated the importance of managing people at work, and in particular, the planning and managing of their careers. In addition to the opportunities for growth and development, the desire that people have for their careers is a significant factor.

A career development program must regard the aspirations of each employee and the organizational opportunities that practically can be expected to progress for each. Failing to match the internal career sought by the employee and the external career offered by the organization will result in suboptimal management of human resources. Hence, career management requires initiative from both organizations as well as individuals in order to give maximum benefit for both. It is the goal of all quality organizations to provide their employees greater opportunities to grow, both individually and as professionals. Noting has greater than hiring the right people and having them develop simultaneously with the company's own growth. This creates continuity of management and knowledge and an environment for employee to thrive and grow. It has been regularly shown that appreciation and growth can be stronger motivators for an employee than money and can result in reduced turnover rate, improved customer service and ultimately generates higher profits for the company. With this in mind, it is best to lay clear expectations for performance so that employees can achieve both personal and professional growth. Employees should understand that their employer is committed to making every effort to educate them so that they can expand their horizons and take on new responsibilities over time and being employable.

According to McDaniels and Gysbers (1992), career development is the total constellation of psychological, sociological, educational, physical, economic, and chance factors that combine to shape the career of any given individual over the life span. Greenhaus, Callanan and Godshalk (2000) suggests that career development is an ongoing process by which individuals progress through a series of stages, each of which is characterized by a relatively unique set of issues, themes, and tasks.

Career development programs are most effective when they are integrated with the organization's ongoing training and development strategies. An automated and well-designed career management system not only benefits organizations but also help employees and managers or supervisors in establishing effective communication with each other. All the parties gain different benefits and combining which they can together set an organizational culture that supports such types of activities in an organization.

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REVIEW OF LITERATURE

The review of literature focuses on the application of career management and development systems for improving employees' career motivation and commitment because of the supposed link between career management, performance, developmental behaviour, and participation in development activities. No empirical research has investigated the relationship between the career management process, developmental behaviour, and job performance. Developmental behaviour and activities (e.g. attending courses, reading journals, or initiating new projects) are planned to enhance personal and professional growth (London, 1989). Earlier studies of career management have focused on only one aspect of the career management process, such as exploration behaviour or career goal setting (e.g. Stumpf, Colarelli and Hartman, 1983). In this study, the influence of several aspects of career management is concurrently investigated. Most other studies of career management have used student samples. The huge majority of studies of career management have used outcome measures related to personal effectiveness such as satisfaction with occupational choice and career information (Greenhaus and Sklarew, 1981; Stumpf et al., 1983). Naturally, with proper career planning and career management, an individual expects to reap the result of such investment by attaining career development.

This concept of career planning and development initiatives promoting organizational effectiveness relies on the organization's ability to transfer employees from a traditional pattern of expectation to one of augmented responsibility for their own career growth and development (Martin, Romero, Valle & Dolan 2001). A well-designed career development system enables organizations to tap their wealth of in house talent for staffing and promotion by matching the skills, experience, and aspirations of individuals to the needs of the organizations. In addition, it enables them to make informed decisions around compensation and succession planning to attract, retain and motivate the employees, resulting in a more engaged and productive workforce (Thite 2001, Kapel & Shepherd 2004, Kaye 2005). Career development must be an ongoing system linked with the organization's human resource (HR) structures and not a onetime event (Leibowitz, et al.1988). This paper attempts to explore on variables that link career management and employee development to performance in Indian IT organizations.

OBJECTIVES OF RESEARCH|

- To find out the employee's perceptions about career management and employee development dimensions,
- To measure the degree of career exploration by employees,
- To identify the career goal characteristics of employees,
- To measure the degree of career strategies of the employees,
- To find the manager's support for the development of the employees and to measure the willingness of the employees to participate in development activities,
- To find the extent to which the employees are engaged in developmental behaviour.

METHODOLOGY USED

Sample Size and Technique Adopted

It is an exploratory study made with an intension to study different variables that link career management and employee development to performance in Indian IT organizations for which 100 employees from 5 top Indian IT Companies were selected as the sample population. The technique used was simple random sampling.

Sources of Data

Secondary data were collected from Internet, books, newspapers, journals, business magazines etc. Primary data was collected through a self-administered and non-disguised five-point scale questionnaire, which consisted of 19 statements. The scale was Likert's five-point scale and the respondent was to rate each item on a 5- point Likert scale, for the value and frequency of its practice by the employees.

Variables under Study

Career Management

It is a continuous process of evaluating your current lifestyle, likes/dislikes, passions, skills, personality, dream job, and current job and career path and making corrections and improvements to better prepare for prospect steps in your career, as needed, or to make a career change. Career planning is a lifelong process, which includes choosing an occupation, getting a job, growing in our job, possibly changing careers, and eventually retiring. The career planning process consists of four steps:

- **Self:** Gather information about yourself (self-assessment) i.e., gathering information about oneself in order to make an informed career decision.

- **Options:** Exploring the occupations in which you are interested i.e., Gathering career information is an important part of the career planning process. This information includes employment outlook, salary, related occupations, education and training, and job duties. Find what you need in these articles, descriptions, and interviews. Research the industries in which you would like to work i.e., Research about the Labour market.
- **Match:** During this phase of the process, you will - Identify possible occupations, evaluate these occupations, Explore alternatives, and lastly choose both a short term and a long-term option.
- **Action:** In this phase you develop the steps needed to take in order to reach your goal, for example: Investigating sources of additional training and education, if needed, Developing a job search strategy, Writing your resume, Gathering company information, Composing cover letters, and Preparing for job interviews.

Employee Performance

Performance is getting the job done and producing the result that you aimed at. Performance management is the systematic process by which an agency involves its employees, as individuals and members of a group, in improving organizational effectiveness in the accomplishment of agency mission and goals. Employee performance management includes - Planning work and setting expectations, continually monitoring performance, Developing the capacity to perform, periodically rating performance in a summary fashion, and Rewarding good performance.

Employee Development

Employee development is a joint, on-going effort on the part of an employee and the organization for which he or she works to upgrade the employee's knowledge, skills, and abilities. Successful employee development requires a balance between an individual's career needs and goals and the organization's need to get work done. Employee development programs make positive contributions to organizational performance. A more highly skilled workforce can accomplish more and a supervisor's group can accomplish more as employees gain in experience and knowledge.

Respondent Profile

42% of the respondents were in the age group 26-35 years followed by 36% (18-25 years), 14% (36-40 years) and 8% were above 40 years. The male respondents constituted 62% and the female respondents were 38%. Work experience of the respondents in the present organization was 1-2 years for 36%, less than 1 year 27%, more than 4 years 20% and 17% were between 2-4 years.

FINDINGS & INTERPRETATION

Objective-1: To find out the employee's perceptions about career management and employee development dimensions.

Table-1

Career Management/ Employee Development Dimensions	Means
Developmental behavior	3.57
Career Exploration	3.15
Career goal characteristics	3.01
Career Strategies	3.00
Willingness to participate in development activities	2.95
Manager's support for development	2.79

Sources: Authors Compilation

The mean values indicate that maximum IT employees under study perceive career management and employee development as a developmental tool (3.57) followed by opportunities to explore career (3.15) and career goal characteristics (3.01). Manager's support for development was perceived the least (2.79) and willingness to participate in developmental activities moderately (2.95).

Objective-2: To measure the degree of career exploration by employees.

Table-2

Career Exploration	Means
To what extent have you sought information on specific career areas or jobs in which you are interested?	3.64
To what extent have you reflected your experiences that can be integrated into your future career?	3.20
To what extent have you tried new work roles?	2.67

Sources: Authors Compilation

The mean values indicate that while career exploration IT employees seek more often information on specific career areas or jobs that they are interested (3.64), followed by reflection of past experiences to be integrated into ones future career (3.20) and least engaged in trying out new work roles just to see if they liked them (2.67).

Objective-3: To identify the career goal characteristics of employees.

Table-3

Career Goal Characteristics	Means
How sure are you about your career goal?	3.19
In your opinion, do you need many positions or jobs to hold in order to reach your career goal?	3.01
Have you met your career goals?	2.84

Sources: Authors Compilation

IT employees were very clear about their career goals (3.19), and were of the opinion that they need many positions or jobs to hold in order to reach their career goal (3.01), and they were not fully sure that they have met their career goal (2.84).

Objective-4: To measure the degree of career strategies of the employees.

Table-4

Extent of Career Strategies Engaged	Means
To what extent have you tried to develop skills, which may be required to attain your career goal?	3.34
To what extent have you built a network of friendships in the division, which could help further your career progression?	3.24
To what extent have you built a network of contacts within the division for obtaining information about events, changes, or activities within the division?	3.13
To what extent have you taken leadership in work areas where there appeared to be no leadership?	2.74

Sources: Authors Compilation

IT employees preferred developing skills (3.34) as the dominant strategy for achieving career goal followed by building a network of friendships in the division which could help further ones career progression (3.24), and building a network of contacts within the division for obtaining information about events, changes, or activities within the division (3.13), and the least preferred strategy was being a leader in work areas where there appeared to be no leadership (2.74).

Objective-5: To find the manager's support for the development of the employees and to measure the willingness of the employees to participate in development activities.

Table-5

Manager's Support For Development And Willingness To Participate In Developmental Activities	Means
To what extent does your boss give you feedback about your performance?	2.79
Are you interested in attending meetings and seminars on new work methods?	2.95

Sources: Authors Compilation

IT employees felt that their boss only moderately supported and gave them information and feedback about their performance (2.79) and it was found that IT employees were only moderately inclined to and interested in attending meetings and seminars on new work methods (2.95). IT managers moderately give feedback about employee performance, which can aid them to make career choices and build their future career. IT employees either do not find the time to attend career seminars or do not have access to these to help them make appropriate career choices and experience growth and development.

Objective-6: To find the extent to which the employees are engaged in developmental behaviour.

Table-6

Developmental Behaviour	Means
To what extent are you keen for projects, committee work, or special assignments in order to improve skills or acquire new skills?	3.55

Sources: Authors Compilation

IT employees were only moderately keen in engaging and taking up projects, committee work, or special assignments in order to improve skills or acquire new skills (3.55).

IMPLICATIONS TO INFORMATION TECHNOLOGY ORGANIZATIONS

To augment Individual factors in career management and employee development, employees need to engage in career counseling, attend career workshops and seminars, use career workbooks, enroll for e-learning programs, chose job rotation and use formal and informal networks to discuss career interests and explore career options through learning and training.

To enhance managerial factors managers need to provide coaching, mentoring, continuous feedback on performance and provide opportunities for growth and networking. They should try to find out the employee's career interest and provide them the opportunities. Career paths and succession planning should be communicated to them.

To enhance organizational processes as they affect the career management and employee development IT organizations need to introduce systems that are fair and just. Provide opportunities for growth and development by allowing employees to engage in special assignments and provide detail information about opportunities for career growth and development. Introduce growth that is more horizontal and job enrichment, by providing challenging assignments and a variety of tasks to employees.

Organizations need to create a proactive and developmental culture, which revolves around maintaining and forging positive friendship and relations among members of various levels, job rotation and enrichment program to develop new skills and formal career guidance programs.

Opportunities should be created by increasing the number of positions and roles in the organizations that are not only challenging but also where employees can experience growth and development and leverage their experiences.

CONCLUSION

The study found that individual factors contributed maximally to IT employee's career growth, followed by managerial factor, organizational processes, organizational culture and least factor was opportunities for career growth. The strongest individual factor that influences career growth was found to be meeting career goal, followed by new work roles, special assignments, develop new skills and leveraging past experiences.

A career is not just a job, but revolves around a process, an attitude, behavior and a situation in a person's work life to achieve set career goals. Although career is the property of individuals, but for the employed, organizations should plan and manage employee careers. Career management requires initiative from both organizations as well as individuals in order to provide maximum benefit for both. In the budding world of the present and the future, the practices of career development are being challenged to find new paradigms and new scientific bases. With proper career planning and career management, an individual expects to reap the result of such investment by attaining career development.

LIMITATIONS OF STUDY

- The complete domain of career strategies and performance outcome was not investigated. Objective performance outcomes (e.g. innovations, cost-savings) not collected in this study might be related to career management.
- Different career strategies such as job involvement might positively influence performance or developmental behaviour.
- Lack of comparison between the employees and managers who participated in the study with the non-respondents.

REFERENCES

1. Megginson, Leon C. (1977). ***Personnel and Human Resources Administration***, pp. 4. Richard D. Irwin Inc., Homewood, Illinois.

2. Sur, Mary (Ed.). (1973). ***Personnel Management in India,*** pp. 31. Compiled by Indian Institute of Personnel Management, Asia Publishing House.

3. Douglas McGregor. ***The Human Side of Enterprise,*** pp. 3-4. New Delhi: Tata McGraw Hill Publishing Co. Limited.

4. Torraco, Richard J. (2004, Summer). Challenges and Choices for Theoretical Research in Human Resource Development. ***Human Resource Development Quarterly*****,** 15(2), 171-188. Copyright © 2004 Wiley Periodicals, Inc.

5. Tony, Carter J. D. (2009). Managers Empowering Employees. ***American Journal of Economics and Business Administration,*** 1(2), 39-44, © 2009 Science Publications.

6. Tuuli, M. M., & Rowlinson, S. (2007). Towards a conceptual framework of empowerment and job performance in project teams. ***In: Boyd, D (Ed) Proceedings 23rd Annual ARCOM Conference***, 3-5 September 2007, Belfast, UK, Association of Researchers in Construction Management, 3-12.

7. Kintana, M. L., & Alonso, A. U. et al. (2006). High-performance work systems and firms' operational performance: The moderating role of technology. ***International Journal of Human Resource Management,*** 17(1), 70-85.

8. Hall, R. (2000). Outsourcing, contracting out and labour hire: implications for human resource development in Australian organizations. ***In Asia Pacific Journal of Management,*** 38(2), 23-40.

9. Hays S. W., & Kearney, R. C. (2001, September). Anticipated changes in human resource management: Views from the field. ***In Public Administration Review***, 61(5), 585-90.

10. Ko, J. J. R. (2003, Summer). Contingent and internal employment systems: substitutes or compliments. ***Journal of Labour Research,*** 24(3), 473-91.

11. Career Evolution. (2000, January 29). ***The Economist,*** 89-92. Carol Hymowitz. (2000, May 9). Managers Often Miss the Promising Talent on their Own Staffs. ***The Wall Street Journal*****,** B1. Michelle Conlin. (2000, April 24). Working Life. ***Business Week***, 99-104. Robert Taylor. (2000, May 19). Reports of the Career's Death Are Exaggerated. ***Financial Times*****.**

12. Thurm, Scott. (2001, February 6). No Exit Strategies. ***The Wall Street Journal***, 1A.

13. Nunn, John. (2000, September/ October). Career Planning: Key to Employee Retention. ***Journal of Property Management*****,** 20-21.

14. Garland, Susan. (2000, October 9). When your job does not fit. ***Business Week*****,** 206-210.

15. Greller, Martin M., & Simpson, Patricia. (1999). In Search of Late Career: A Review of Contemporary Social Science Research Applicable to the Understanding of Late Career. ***Human Resource Management Review*****,** 3, 309-347.

16. Retrieved from http://bmdynamics.com/issue_pdf/bmd110166_India_24_31.pdf

17. Retrieved from http://careerplanning.about.com/od/careerchoicechan/f/career-development.htm

18. Retrieved from http://chimc.in/Volume2.1/Volume2Issue1/DrJitendraKumarsharma.pdf

19. Retrieved from http://managementstudyguide.com/benefits-of-career-development-system.htm

20. Retrieved from http://nexteptalent.com/Career-Guidance.html

21. Retrieved from http://rphrm.curtin.edu.au/2006/issue1/empirical.html

22. Retrieved from http://www.arcom.ac.uk/-docs/proceedings/ar2007-0703-0712_Wood_and_Ashton.pdf

23. Retrieved from http://www.bmdynamics.com/issue_pdf/bmd110166_India_24_31.pdf

24. Retrieved from http://www.datadanesh.com/freearticle/1002.pdf

25. Retrieved from http://www.freepatentsonline.com/article/Research-Practice-in-Human-Resource/153309120.html

26. Retrieved from http://www.ggram.com/pdf/career-planning-pdf-3.html

27. Retrieved from http://www.kobusweyers.co.za/Career-Development

28. Retrieved from http://www.law.cornell.edu/cfr/text/5/430.102

29. Retrieved from http://www.logindo.co.id/?cat=46

30. Retrieved from http://www.logindo.co.id/?p=1901

31. Retrieved from http://www.managementstudyguide.com/benefits-of-career-development-system.htm

32. Retrieved from http://www.net-temps.com/employers/hrcorner/printer.htm?id=23&pf=1

33. Retrieved from http://www.opm.gov/perform/AppraisalDesignInformationSheet.pdf

34. Retrieved from http://www.opm.gov/policy-data-oversight/performance-management/overview-history

35. Retrieved from http://www.quintcareers.com/jobseeker_glossary.html

36. Retrieved from http://www.sdcity.edu/CollegeServices/StudentSupportResources/CareerServices/CareerPlanningSteps/Res...

37. Retrieved from http://www.searchenterprises.com/jobseekers.html

38. Retrieved from http://www.slideshare.net/beedivb/journeying-the-teaching-profession-myself-and-my-career-by-rose-an...

39. Retrieved from http://www.slideshare.net/zubairsorathia/03-career-planning-process

40. Retrieved from http://www1.umn.edu/ohr/toolkit/development/index.html

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RETHINKING + REDESIGN = RE-ENGINEERING

Dr. Ramandeep Kaur[14]

ABSTRACT

The re-engineering is a very superior concept in IT and Business parameters. This aspect is useful is present and will useful in future. The re-engineering is starts from existing system to rebuild this system with rethink and re-design. In this research, re-design has different approaches in the product. These are used for process to maintain and remake a product or software. This topic has also discussed with different type of phases of re-engineering. Remake a product has many benefits like lower cost, lower risk, business rules revelation, improvement of documentation and quality, increment development of product.

Business process strategies work on the company environment as well as it creates effect on product. It has many benefits such as increase effectiveness, reduce cost, good job for employee, organizational approach in improvement, business growth, and improve efficiency. This re-engineering has basic objectives for reconstruct the product in business, which is present requirement by the customers.

KEYWORDS

Re- Engineering, Process, Phases, Business Process Re-Engineering, Objects etc.

INTRODUCTION

The concept re-engineering obtained from engineering again or repeats. In the business and technologies, existing applications need to some updated to math new reality. This is important for a company to be at the top level. The smart phones, notepad and tablets etc. are a great opportunity to make business follow everywhere in anytime. If old software has not updated then it has option for re-engineering means redesign. It is examine, analysis, and allocation in existing software system and implement in new system.

The main goal is to understand the existing system and after that re-implement it to improvements of system with functionality, performance, and implementation. The main object of reengineering is to maintain the existing functionality and purpose for functionality to be added later.

OBJECTIVES OF STUDY

The large numbers of built systems are in use with high proficiency. While an existing system's functionality is remaining same, the context of new system, such as system hardware, software and environment are different.

Sometimes existing system has many type of problems occurred like lacking of good design structure, code organization, high cost of program. Companies do not want to trash their projects, if they do then all data will lost. So they reuse through re-engineering is possible,

The new installments in the existing system are done with the help of new technology.

MODEL OF RE-ENGINEERING

Although, the specific objective of reengineering are determined by the goals of firm are given below:

- Preparation for Functionality,
- Maintainability Improvements,
- Migration,
- Reliability Improvements.

This model has two type of engineering – reverse and forward. Reverse engineering is existing system to alteration system and forward engineering is a target system after editing existing software. In the model, after re-engineering planning products is implemented in new form. In addition, after that software re-engineering process will complete successfully.

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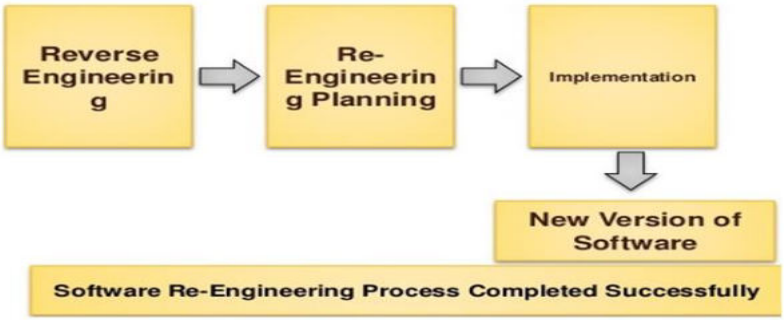
Figure-1: Model for Re-engineering



Sources: Authors Compilation

- **Reverse Engineering**
  The reverse engineering takes a finished product with object and aim, how it works by the use and testing it. This all procedure is done by the company that seeks to competitor's market to understand new products. It is process to discover the new technologies of human made devices for system through analyze its structure, function and operations. It try to make a new program that does the same function without using duplicating any part of original.

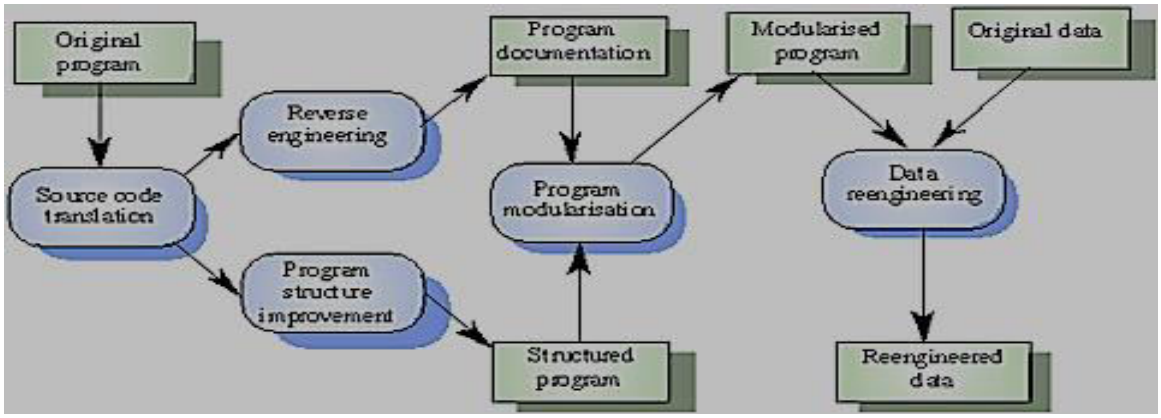
- **Forward Engineering**
  The new system (target system) is crested by the moving downward through the levels of abstraction. These downward movements are actually called forward engineering. This engineering moves from logical level implementation to physical level implementation of system. This process has high degree risk due to preparation during reverse engineering.

PROCESS OF RE-ENGINEERING

The re-engineering process activities are given below in steps:

- Source Code Translation,
- Reverse Engineering,
- Program Structure Improvement,
- Program Documentation,
- Modularization of Program, and
- Data Re-Engineering.

Figure-2



Sources: Authors Compilation

The process of reengineering is starts from original form to change through source code translation. After that go with reverse engineering with the documentation of programs. Furthermore, program documents are becomes modularizes program with program structure, and after this module data will re arrange into re-engineering. Finally, data becomes in the form of re-engineering data. This is the process from original data to re- engineering data.

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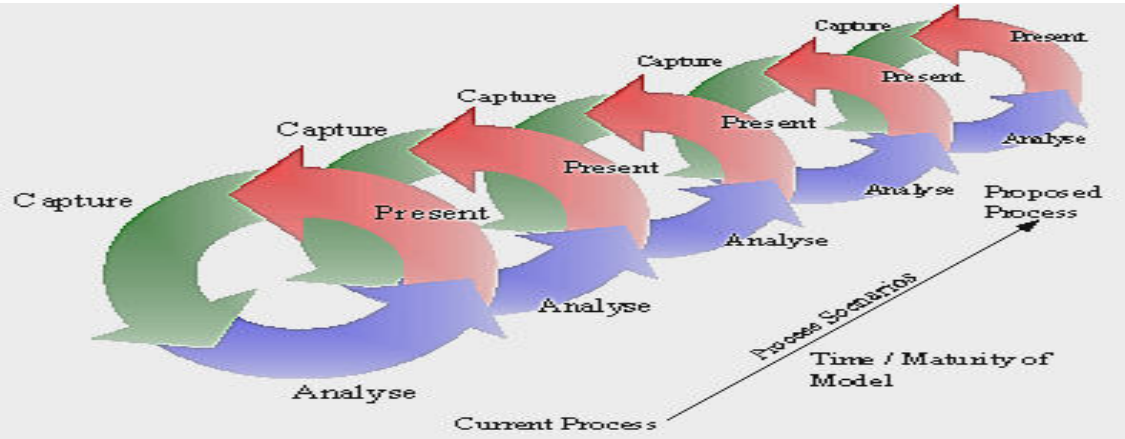
PHASES OF RE-ENGINEERING PROCESS

There are five phases of re-engineering process activities. All are processed one by one. These are given below:

Figure-3



Sources: Authors Compilation

These are in detailed given below:

Team Formation*:* The team will manage the re-engineering efforts from start to end will need training- how to manage the technological change and use of development and maintained process. They all will be responsible for testing, identifying and for buy new tools. The team will also involve for future research in technology.

Project Feasibility Analysis: Analyzed term means specify the main problem include objective, motivation, constraints and business rules. Once all expectations are made, and then they expressed the reduction of cost of re-engineering, reduction of cost of re-engineering and improve the performance.

Analysis and Planning: In the re-engineering analysis, have three steps:

- Analysis all system,
- Specify characteristics,
- Validation of functions.

All these steps are begins by located all available code and documentation include all type of designs of existing system software as well as specification requirements.

Re-engineering Implementation: Implementation of software is last step for recreating. After all desired level of abstraction is reached, forward engineering can begin. This engineering corresponds exactly to normal software development process. Throughout this phase, quality assurance and configuration management discipline and all techniques must be applied in system.

Transition and Testing*:* The last step is Transition and Testing. After implementation of software, whole software will be tested with different modules. Testing must be done to detect the errors in the re-engineering of software. The test cases can be applied to both systems legacy and target to compare the result to validation the functionality of target system.

BENEFITS OF RE- ENGINEERING

Re design of software have many advantages rather than new developments of whole program, these benefits are given below with some detail:

- **Lower Cost:** The re-engineering existing system is less than new system development.
- **Lower Risk:** This system is totally based on increase the improvement of system rather than system replacement.
- **Existing Staff Expertise:** The staff expertise can be maintained and extended accommodate new skills in the engineering.

- **Business Rules Revelation:** The businesses rules are related to the system are re generated.
- **Incremented Development:** In the system, the re-engineering is beneficial for incremental improvements and developments.
- **Other Restructuring Benefits:**
    - Improvement of documentation and quality,
    - Easy to test and debug,
    - Easy to learn, improve productivity.

Cost of Reengineering

Maintenance cost= Cost of Operation
(Annual)
+
Maintenance of program
(Lifetime)

Re-engineering= investment reduced by the cost of implementation changes and risk factor

Cost Benefits **=** Cost of reengineering – Cost of maintenance

BUSINESS PROCESS RE-DESIGN

The Business process Re-Design is the concept of re-thinking and radical redesigning of business process in order to improvement in the performance such as cost, services, quality and speed. It is also called business process re-engineering, business process change management or business transformation. Business process is set of logical tasks to achieve a goal for business overcome. Business process has many benefits to organizations. Some of them are given:

- **Increase Effectiveness:** In the company, all employees have a greater sense of responsibility of process. In addition, all processes are completed under the control of management. That is why; employee has delivered high quality products to their consumers.
- **Reduce Cost:** In the high efficiency and proper management of product in process as well as quick delivery of product to buyer, due to all these effects, cost is reduced.
- **Good Job for Employee:** The organizations have many meaningful jobs and responsibilities to be performed by the staff. This can be lead their level to motivation, and perform well.
- **Organizational Approach in Improvement:** The management of company followed strict rules for staff members. Most organizations has improvement business process redesign, there is a growth in flexibility and adaptability for change, and this has created better atmosphere for working staff members, thus leading to staff satisfaction.
- **Business Growth:** Implementation Business process reengineering creates results of growth in business products, and it develops new businesses within the existing organization. It is important to have support from top management.
- **Improve Efficiency:** Re-engineering is helps to improve the efficiency of product bases on proper management and control all process of product, and reduce the time between made to delivery.

OBJECTIVES OF BUSINESS PROCESS RE-DESIGN

When a company applies business management techniques, the team of organization of staff is focused on different type of objects. Some of these objectives are given below:

- **Customer Focus:** A company should be focus on the services of product, so that customer can avail all facilities regarding product.
- **Speed:** Product must be making in very less time and delivered to the customer as soon as possible.
- **Quality:** The product quality should me good for services as well as all requirements will meet.

- **Compression:** The product cost is cutting from the capital value. Product cost should be less as well as capital cost. Get the decision to buy the raw material in some discount.

- **Flexibility:** In the business process reengineering, company has seen the current market requirement, according to the customers product should be flexible.

- **Innovation:** The level of quality is always superior. In addition, quality and value both are fit for product and customer. New requirements of product are built in exiting system.

- **Productivity:** In the products should be increase drastically effectiveness and efficiency.

CONCLUSION

Re-engineering perform several changes with all aspects of product. It will happen in future also. All organizations makes the plans regarding designed to achieve their business goals. These plans will depend on the nature of process and operations, capacity and requirements of customer services. Less time and good quality, and services for the product will help in future by the organizations.

REFERENCES

1. Business Process Reengineering Online Learning Center. ***Business Process Reengineering***. Retrieved January 28, 2004 from http://www.prosci.com/reengineering.htm

2. Department of Defense. ***Business Process Reengineering*** (BPR) Fundamentals. Retrieved January 28, 2004 from http://www.defenselink.mil/nii/bpr/bprcd/7223.htm

3. Davenport, T. H., Prusak, L., & Wilson, J. H. (2003, June 23). Reengineering Revisited. Computerworld, 25, 48-50. Retrieved January 25, 2004 from ***EBSCO Academic Search Elite***.

4. Hammer, M., & Champy, J. (1993). ***Reengineering the corporation: A manifesto for business revolution.*** New York: Harper Business.

5. King Fahd, University of petroleum and minerals. ***Software evolution, re-engineering and reverse engineering***. SWE 316: Software design and architecture.

6. Laporte, Cloud Y. ***Risk management applied to the re-engineering of a weapon system.*** Guy boucher orlikon contraries Inc.

7. Ahmed Saleem Abbas, W. Jeberson. (2012, February). The need of re-engineering in software engineering. ***International Journal of Engineering and Technology,*** 2(2).

8. Retrieved from www.benifitsof.net/benefitsofbpr

9. Atlantes Technology. ***Benefits of reengineering a legacy system.*** Retrieved from www.altantstechgroup.com

10. Retrieved from www.en.wikipedia.org/wiki/businessprocess

11. Retrieved from www.rtsoftwaregroup/services/softwarereengineering

12. Retrieved from www.uniquesoft.com/

13. Sotiris Zigiaris, BPR engineer. Business process reengineering. ***Report produced for the EC funded project, BPR hellees, SA***

14. Fagleman, Lews J. eHow contributor. ***what is different between reverse engineering and reengineering***.

15. Introduction of software engineering / reverse reengineering/reengineering. Retrieved from www.en.wikibooks.org/w/index.php

16. Retrieved from http://edweb.sdsu.edu/people/ARossett/pie/Interventions/reengineering_2.htm

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STUDENTS PERCEPTION ABOUT HIGHER EDUCATION IN BENGALURU: A STUDY

Dr. Suhas B. M.[15]

ABSTRACT

Higher education in India shown tremendous growth since 2000 both qualitatively and quantitatively. The present study aims at understanding higher education its importance, perceptions and challenges faced. Higher education in India assumed unprecedented prominence in the country and continues to be extensively researched and deliberated. India's demographic data reveals that it will soon over take China as the world's largest population and with an average GDP annual growth of 8% over the last decade, its middle class that demand higher education will touch a high 500 million people in the next year opting higher education.

The severe transformation in higher education demand may trigger further and grow by 2020. However, the low rate of enrollment, low quality of teaching, constraints in research and development, uneven access to opportunity should be addressed on a priority basis and maximum preparation must be made to make higher education "savvy higher education" liked by all. India's public expenditure on education both center and state stands at between 3.26% to 3.85% from 2004-05 until 2009-10 and there is absolute need to enhance public expenditure on education. Further there is greater need felt at present to reduce the gap between demand and supply since admissions into the elite institutions of management admission ratio is 1:10.

KEYWORDS

Quality, Infrastructure, Public Expenditure, Challenges, Demand, Gross Domestic Product etc.

INTRODUCTION

India is facing an unprecedented transformation in the coming decade because of changes driven by economical demographic change. India will have one of the youngest populations in the world with an average age of 29 years[1]. It is predicted that in 2020, 200 million of the world's 20-34 years old will be university graduates and 40% of these will be from China and India[2], representing a huge proportion of the global talent. It is the right time to think, act, and incorporate suitable changes in order to stand up to expectations. However, it is a fact that the general standard of education higher is low. There are no enough places in schools, colleges or universities to cope with the enormous and ever increasing demand in some colleges. The deficiency in the supply side and low standards of higher education made the private players to enter education spectrum across the country. The private sector already discharging significant role in the development of higher education and it is predicted that in the days to come the private presence and influence in the area higher education will be felt more and more.

By 2020, it is predicted that India needs 40-million university places[3] - an increase of 14 million - and 500 million skilled workers[4]. Over the last decade, higher education has been on a steep growth trajectory and India now has the largest higher education system in the world in terms of the number of institutions and the second largest in terms of the number of students.

OBJECTIVES OF STUDY

The objectives of the present study are listed below:

- To understand the quality oriented education provided to the students in Bengaluru.
- To understand the awareness of importance of higher education in Bengaluru.
- To understand the challenges of higher education in Benglauru.
- To study the influence of demographic variable on higher education at Bengaluru.

HYPOTHESES OF STUDY

- Management students are aware of significance of higher education.
- There is no association between the perceptions of students towards management education with their level of education.
- Perception of students towards management education is not associated with their age.
- The students at Bengaluru have no perception level towards higher education.
- The students at Bengaluru do not have perception level about challenges of higher education.

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RESEARCH METHODOLOGY

The present study is explorative in nature and the scope of the study is confined only to Bengaluru urban. A well-drafted questionnaire in English was administered to collect valuable data from 300 samples where in Bengaluru is the universe and 300 students are samples fit essential for the study purpose. The questionnaire was pretested before it was administered and in the light of experience, the final questionnaire was amended and remodeled. Convenient sampling technique was used and Bengaluru was divided into 4 divisions and from each division 75 students were covered. The collected data was presented in the form of tables and extensive use of percentages was done in addition to use of chi-square and ANOVA analysis in order to give a scientific touch to the data analysis and presentation. The data collection started on 1st October 2014 and ended 31st October 2014, and 375 questionnaires were issued and 75 stood as cancellable.

REVIEW OF LITERATURE

Kaushik and Agarwal (2012)[5] reported four challenges facing management education in India. Owners lack the academic orientation needed for delivering quality education, including infrastructure, faculty, technology, workshops. Secondly high turnover of qualitative teachers, discipline problem among the students lack of support from school administration, poor working conditions, weak financial incentives, failure to adopt technology into higher education. Thirdly poor hiring system and finally lack to adopt latest teaching pedagogy.

Sanchita and Goel (2012)[6] have examined the status of education management in India. They stated that although management education has grown significantly over the period in India, there are challenges facing management education such as quality, equity, commercialization, assessment and examination, quality of teachers, cost of education and global completion. They highlighted that the present system of higher and management education produced graduates with some knowledge and information, but it was failed to develop general employability skills needed for entry level of employees.

Hundekar Shollapur (2000)[7] opines that management education prepared career seeking, effective business managers who in due course develop into competent and socially sensitive organizational leaders and change agents. The universities and B-schools should produce the best of the human capital measuring up to the expectations of emerging business world industry, and overall aspirations of the nation.

Rao (1999)[8] says that quality of management graduates in the institutions is open to doubt according to leading corporate houses. In the absence of rigors admission criteria, the field is wide open for mediocre participants to enter freely. Since the whole activity takes the shape of money spinning venture for innovative entrepreneurs in the field of management education, there are no funds for library, books, seminars, symposiums and industry interaction.

Choudhary (1999)[9] says that it happens everywhere that whenever there is quantitative growth as in case of educational sector it impacts the quality. However, countries that have evolved system of quality assurance / audit have been able to overcome the problem and could meet the expectation of all and the stakeholders reasonably well.

Ralph and Dougles (1998)[10] viewed that it is important the management institutes must adopt to the changing expectations of the important constituents participants, faculty, industry, administrative staff, society, management, alumni, experts and government officials. Further, they have expressed that through teaching, learning and research may remain, as core activities of a management institute, the real responsibility of the institute should be to create a value adopted participant resource that the employers may consider useful.

Dinkar (1998)[11] says that along with the above one must study the new trends in management like internationalization, cross-cultural varieties, partnerships and strategic alliance (for example ISB of Hyderabad) that are reflections of what is happening in the business - industry sector. Quality in Education has been defined variably as value addition in education (Feigenbawm 1951)[12], fitness for purpose Tang & Zairi (1998)[13] and fitness of educational outcome and experience for use (Juran & Gryna, 1988)[14].According to Sponbauer (1995)[15] education is a service with customers like any other business, and those customers express satisfaction and dissatisfaction about school service and instruction.

Widrick and grant (2002)[16] have measured three quality dimensions (quality of design, quality of conformance and quality of performance) in higher education. They have developed the quality of research and curriculum development and tools techniques necessary for evaluating them.

SURVEY FINDINGS

Table-1 reveals information about demographic profile of respondents. There are 190 or 63% males the remainder females. There are 160 respondents belonging age up to 25 years, 118 up to 30 years and only 22 up to 30 and above. 50% of the students are graduates, 120 or 40% are postgraduates and the rest professional education. The family income data reveals that there are 110 respondents or 37% a majority belonging to the income group of Rs. 30000 to 40000. 90 respondents Rs.40000 and above. The

income data reveals clearly the parents at Bengaluru are ready spent on better higher education. Importance of higher education is measured and presented in the Table-2. Factors of importance are variable in nature and varies between higher education provides job to higher education prepares students as socially sensitive organizational leaders. 160 or 53% of students high level of possess knowledge about factors deciding importance of higher of higher education, 110 respondents expressed they are aware of influencing factors of importance medium and the rest 30 expressed they are aware of influencing factors of importance medium and the rest 30 expressed clearly possessing low level of factors deciding importance of higher education. The chi-square analysis also supports clearly the students at Bengaluru have knowledge of factors that influences the importance of higher education.

Table-3 shows the association between perceptions of students towards management education with their level of education. The views expressed vary from tough course to higher education providing a blend of intellectual and personality development. There are 150 or 50% who expressed views on association between management education and the level of education. There 120 post graduates and the rest 30 professional education background students .The chi-square analysis reveals clearly there exists association between the perception of students towards management education with their level of education attained. Table-4 highlights association between the perceptions of students towards management education with their age. Since the calculated value is less than the critical value or table value, it becomes known that management education in Bengaluru is not associated with their age.

Table-5 indicates that 70 respondents feel management course is tough in nature. Little less than the above 21% feels that it is more professional than academic in nature. 40-feel challenging, 45 only and enjoyable 48 feel blend to intellectual and personality development. The chi-square analysis reveals that the students of Bengaluru possess different perceptions. Table-6 reveals data on students perception about challenges of higher education while framing questionnaire it was decided only a set of parameters, which are challenging higher education in Bengaluru, was considered. Accordingly, these parameters vary from infrastructure to quality education. The measurement was put on the model of 5 point Likert scale with greater extent, considerable, some extent little and not at all. 165 respondents have expressed that "to a great extent" they possess knowledge of challenges of higher education and 79 respondents only to a considerable extent and remaining 28 to some extent and 18 to a little extent and 10 not at all. ANOVA analysis clearly indicates the students possess perception about challenges of higher education at Bengaluru.

CONCLUSION

In the globalized scenario, Bengaluru is attracting different students across the globe and different stakeholder prefers Bengaluru as a center of learning and ideal place for higher education. Since management education is a process of the individual mind getting to its full possible development, ideal conditions has to be established as it is going to be socially and economical beneficial to the country. Technology integration in the higher education has become inevitable since objectives, contents and methods are triggering major changes in the higher education scenario. The study confirms the existence of various challenges faced by higher education arena with a proper integration of technology into higher education, modified pedagogy, improving infrastructure, better faculty definitely influences a lot and meets the challenges of higher education where in higher education is facing transformation.

REFERENCES

1. (2013). ***Reimagine presentation***. Britain Council.

2. (2014). ***Higher education enrolment low graduate employment.*** Economic Intelligence of unit in partnership with the British Council.

3. (2013). ***Economic Intelligence Unit in partnership with British Council***. Higher education in South Asia; trends in Afghanistan, Bangladesh, India, Nepal, Pakistan and Sri Lanka.

4. Kaushik, V., & Agarwal, M. (2012). Issues, challenges and opportunities in today' era of management education. ***International Journal of Management Research and Review***, 2(7), 1173-1182.

5. Sanchita, & Goel. (2012). Challenges and opportunities in Management Education in India. ***View Point*** 3(1), 29.

6. Handekar, S. G., Shollapur, M. R. (2000). ***Delivering service quality in Management Education.*** Imparities of the new millennium, delivering service quality managerial challenges for the 21st century, edited by M. Raghavachari, KV. Ramani, MacMillan India Limited, 240-246.

7. Rao, V. K. (1999). ***Trends in Education,*** 3, 925-960. Delhi: Rajat Publications.

8. Chowdhary, Nimit R. (2000). ***Initiatives in service quality.*** A literature survey Delivering service quality Managerial challenges for the 21st Century 2000 edited by M. Raghavendrachari, K. V. Ramani, 2000 MacMillan India Limited, 247-253.

9. Ralph, Lewis G., & Douglass, Smith H. (1998). ***Total quality in Higher Education.*** New Delhi: Variety books International.

10. Dinakar S. Raj. (1998, August). ***Long summer in Management Education.*** Indian Management, 37, 51-52.

11. Feigenbaum, A. V. (1951). ***Quality Control: Principles.*** Practice and Administration, McGraw Hill, 42.

12. Tang, K. H., & Zaizi, M. (1998). ***Benchmarking quality implementation in a service context: A comparative analysis of financial services and institutions of higher education part III***, T & M 9(8).

13. Retrieved from http://www.slideshare.net/andrewwilliamsjr/understanding-india-the-future-of-higher-education-and-op...

14. Retrieved fromhttp://www.languageinindia.com/oct2011/shaziaenglishschoolsfinal.pdf

Table-1: Demographic Profile of Samples

Variables	Categories	Count	Percentage
Gender	Male	190	63.00
	Female	110	37.00
Age	Up to 25 years	160	53.00
	25 - 30 years	118	39.00
	30 and above	22	08.00
Educational Level	Graduation	150	50.00
	Post-Graduation	120	40.00
	Professional Education	30	10.00
Family Income	Up to 20000 PM	40	13
	20000 - 30000 PM	60	20
	30000 - 40000 PM	110	37
	40000 and above	90	30

Sources: Primary Data

Table-2: Awareness Among students about importance of Higher Education in Bengaluru

Factors of Importance	Level of Awareness			
	High	Medium	Low	Total
High Education provides job	25	11	3	39
One can become self-sufficient	23	14	3	40
Enhances purchasing power	17	10	6	33
Unemployment Problem solved	26	16	5	47
Creates effective business managers	20	19	3	42
Management education develops competence to compete in the global village	19	24	21	47
Higher education prepares students as socially sensitive organizational leaders	30	16	6	52
Total	160	110	30	300

Sources: Primary Data

Hypotheses

H_0: Management students are fully aware of significance of higher education attained in Bengaluru.

Chi-square Table

Calculated value 13.837, significance level 5%, TV = 21.026 d.f.
(r-1)(c-1) = (7-1)(3-1) = 6 x 2 = 12

Chi-square Analysis

The calculated value being 13.837 smaller than the TV 21.026 @ 5% level of significance with d.f. (r-1)(c-1) = 12 accepts the null hypotheses. Therefore, we may conclude that management students are fully aware of significance of management education.

Table-3: Association between the Perceptions of Student towards Management Education with Their Level of Education

Number of Views Expressed	Upto Graduation	Post Graduation	Professional Qualification	Total
Tough Course	35	27	08	70
More professional than academic	29	28	08	65
High challenging course	14	21	05	40
Easy & simple	30	12	03	45
Interesting & Enjoyable	18	12	02	32
A blend of both intellectual and personality development	24	20	04	48
Total	150	120	30	300

Sources: Primary Data

Hypotheses

H_0: There is no association between the perceptions of students towards management education with their level of education	Reject
H_1: There exists association between the perceptions of students towards management education with their level of education	Accept

Chi-square Table

Calculated value = 19.0435, Sig. level 5% TV = 18.037 =
d.f. (6-1)(3-1) = 5 x 2 = 10

Chi-square Analysis

The calculated value being 19.0435 which is greater than the TV = 180.37 @ 5% level of significance with d.f. = 10 rejects the null hypotheses. Therefore, we conclude that there exists association between perceptions of student towards management education with their level of education.

Table-4: Association between the Perceptions of Students towards Management Education with their Age

Age (Years) Views Expressed	Up to 25	25-30	30& Above	Total
Tough course	40	25	05	70
More professional than academic	35	26	04	65
High challenging course	21	14	05	40
Easy & simple	23	19	03	45
Interesting & Enjoyable	16	13	03	32
A blend of both intellectual and personality development	25	21	02	48
Total	160	118	22	300

Sources: Field Survey

Hypotheses

H_0: Perception of students towards management education is not associated with their age

Chi-square Table

Calculated value 6.0431, significance level 5%, TV = 18.307
d.f. = (r-1)(c-1) = (6-1)(3-1) = 5 x 2 = 10

Chi-square Analysis

The calculated value being 6.0431 smaller than the TV = 18.307 @ 5% level of significance with d.f. = 10 accepts the null hypotheses and therefore we conclude that perception of students towards management education is not associated with their age.

Table-5: Perception of Students towards Management Education

Views Expressed	Number of Respondents	Percentage
Tough course	70	23
More professional than academic	65	21
High challenging charge	40	13
Easy and simple	45	15
Interesting and enjoyable	32	11
A blend of both intellectual and personality development	48	17
Total	300	100

Sources: Primary Data

Hypotheses

H_0: There exists no perception level of students towards management education — Reject
H_1: There exists perception level of students towards management education — Accept

Chi-square Table

Calculated value = 21.56, d.f. = 6, sig. level 5% TV = 11.070

Chi-square Analysis

The calculated value being 21.56 which is greater than the TV - 11.070 @ 5% level of significance with d.f. = 6 rejects the null hypotheses. Therefore, we may conclude that there exists perception level of students about management education in Bengaluru.

Table-6: Perception of Students about Challenges of Higher education in Bengaluru

Perception Indicator	**To a Great Extent**	**To Considerable Extent**	**To Some Extent**	**To a Little Extent**	**Not at All**	**Total**
Better infrastructure	25	9	5	2	1	42
Good Curriculum Design	30	13	4	4	1	52
Advanced Teaching Methodology	28	12	3	3	2	48
Industry Exposure	16	07	2	2	1	28
Better Faculty	26	14	4	4	1	49
Equity & Access	10	06	2	1	2	21
Quality Education	30	18	8	2	2	60
Total	165	79	28	18	10	300

Sources: Primary Data

Hypotheses

H_0: Students at Bengaluru do not have perception level about challenges of higher education	Reject
H_1: Students at Bengaluru Possess perception of about Challenges of higher education	Accept

Anova Table

Source of Variation	**SS**	**d.f.**	**M.S.**	**F-ratio**	**5% F-limit (From F-table)**
Between Sample	2382.8406	(5-1)=4	2382.8406/4 = 595.71	595.71/ 16.1524= 36.88	F(4,30) 3.32
Within Sample	484.5721	(35-5)=30	484.5721/30 = 16.1524		
Total		(35-1) = 34			

Sources: Authors compilation

ANOVA Analysis

The above ANOVA table reveals that the calculated value being 36.88 greater than the TV = 3.32 at d.f. V1 = 4 and V2 = 30 with 5% level of significance rejects the null hypotheses and accepts the alternative. Therefore, we may conclude that students of Bengaluru possess perception about challenges of higher education.

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AGILE SOFTWARE DEVELOPMENT METHODOLOGY: EFFECTS ON PERCEIVED SOFTWARE QUALITY AND THE CULTURAL CONTEXT FOR ORGANIZATIONAL ADOPTION

Pooja Sharma[16]

ABSTRACT

Many traditional software processes are top heavy with documentation and rigid control mechanisms making it difficult applying them to different software projects. New families of processes, referred to as Agile Processes, are making headway into the software industry. Agile methodology that utilizes iterative development and prototyping are widely used in variety of industry projects as a lightweight development method, which can satisfy to the changes of requirements. Short iterations are used that are required for efficient product delivery. Effective methodology and organizational culture are important factors that must be considered to produce innovative teams and quality software.

KEYWORDS

Agile Methodology, XP, Crystal Method, Feature Driven Development, Scrum, Systems Development Methodologies, Organizational Culture and Agile Methodology, Software Quality etc.

INTRODUCTION

Agile methodology emerged due to evolving and changing software requirements changing software requirements. In addition, people are becoming more interested in developing software that better fits their business requirements. Agile methodology accommodates iterative and incremental development by incorporating human values through effective. Agile Methodologies are a group of software development methods that are based on iterative and incremental development. The four major characteristics that are fundamental to all agile methodologies are adaptive planning, iterative & evolutionary development, rapid and flexible response to change and promote communication [1, 2].

Its main emphasis is in obeying the principles of "*Light but sufficient*" and being people-oriented and communication-centered. As it is named as lightweight process, it is more suitable for the development of small projects [3]. Agile software development takes the view that production teams should start with simple and predictable approximations to the final requirement and then continue to increment the detail of these requirements throughout the life of the development. This incremental requirements refinement further refines the design, coding and testing at all stages of production activity. In this way, the requirements work product is as accurate and useful as the final software itself [4].

The principle of agile software development proposes [5] that "*at regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly*". Agile methodology includes a family of lightweight methods that include Scrum, Crystal Clear, Extreme Programming (XP), Adaptive Software Development (ASD), Feature Driven Development (FDD), and Dynamic Systems Development Method (DSDM) Crystal, Lean Software Development etc. [6]. Agile methods break tasks into small increments with minimal planning called Iterations. Iterations are short time frames that runs from one to four weeks. Each iteration involves a team working through a full software development cycle, including planning, requirements analysis, design, coding, unit testing, and acceptance testing. This minimizes overall risk and allows the project to adapt to changes quickly.

BACKGROUND

In early stages of systems development, the project's success or failure often depended on individual experience and talent. However, the boost in project size and complexity led to an increasing need for project management. As a result, systems development methodologies were introduced to foster project success by organizing and controlling development efforts (Fitzgerald, 1994). Avison and Fitzgerald (1988) define systems development methodology as "*a collection of procedures, techniques, tools, and documentation aids which will help the systems developers in their efforts to implant new information systems*". Today, hundreds of commercial systems development methodologies exist and are often organized into different categories according to their fundamental assumptions and approach (Fitzgerald, 1994). The major categories of systems development methodologies include Systems Development Life Cycle (SDLC) methodology, Structured Systems Analysis and Design (SSAD), object-oriented (OO) development approach, the Capability Maturity Model (CMM-SW or CMM) of Software Engineering Institute (SEI), prototyping, Rapid Application Development (RAD), and Agile Software Development Methodology (ASDM).

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POPULAR AGILE METHODOLOGIES

Considering the business view, Agility is the ability of an enterprise to act in advance for the changes happening in the environment in order to maximize the benefits. Customer feedbacks are welcomed by an agile enterprise and try to incorporate those feedbacks in the product [7]. Some of the popular agile methodologies are briefly described as under:

A. Extreme Programming

Extreme Programming (XP) is a high profile agile process known to many advocates and novices alike and is likely the most widely used (Figure-1).

There are four basic values supporting XP:

- ***Communication*** – Without communications project schedules slip, quality suffers, and the customer's wants and needs are misinterpreted or overlooked.
- ***Feedback*** – The need to check our results is important. Without feedback, a project will most likely fail. Feedback tells how a project is doing while providing direction for future iterations.
- ***Simplicity*** – Do not add unnecessary artifacts or activities to a project. Eliminate everything not completely justified.
- ***Courage*** – Putting faith in the people over the process requires courage. It is important to realize, however, that if processes do become more important than the people do, a project is headed toward failure.

Extreme Programming has defined practices and guidelines that implementers should follow. The process begins by gathering stories. These are short use cases, small enough to fit on an index card. Each story is business-oriented, testable, and estimable. From the stories, the customer selects the most valuable set. This set comprises iteration and is coded first. Coding is done in pairs, two people coding on one machine, and iteration is typically one to two weeks long. Once complete the set is tested and put into production. "*The goal of each iteration is to put into production some new stories that are tested and ready to go.*" [8].

Testing plays a major role in XP. Each iteration is subjected to unit testing. Writing all unit tests prior to writing any code is mandatory. A particular iteration must pass its unit testing prior to going into production. Customers determine system wide tests. Considering their needs and referencing the stories, customers think about what it would take to satisfy them that the iteration is successful. These needs are translated into system wide tests. Testing regularly and often at the unit level and system level provides feedback and confidence that the project is moving ahead and the system is functioning according to the customer's requirements.

Figure-1

Sources: Authors Compilation

B. Crystal

Crystal is a family of processes each applied to different kinds of projects. The idea of having multiple processes stems from the thinking that some projects require fewer rigors than others do. Small and non-critical projects can be developed using less rigorous Crystal methods. Larger and more critical projects, however, demand more attention and therefore, a more rigorous Crystal process is used.

Selecting a Crystal process requires that a project be matched to one of four criticality levels:

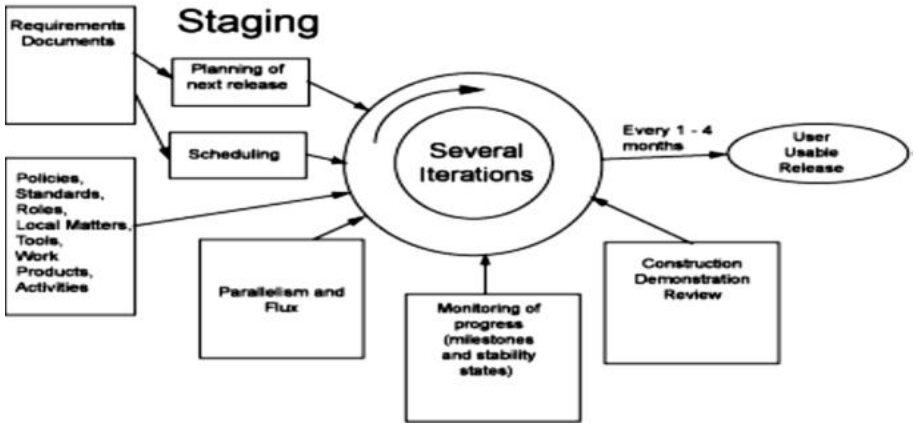
- **Comfort,**
- **Discretionary money,**
- **Essential money,**
- **Life.**

A system failure for the first level may cause a loss of comfort whereas a system failure for the fourth level may cause a loss of life. Using this as an example a less rigorous process is applied to the former while the latter would demand a highly rigorous process. Each of the processes shares common policy standards. [9]

- **Incremental delivery,**
- **Progress tracking by milestones based on software deliveries and major decisions rather than written documents,**
- **Direct user involvement,**
- **Automated regression testing of functionality,**
- **Two user viewings per release,**
- **Workshops for product and methodology tuning at the beginning and in the middle of each increment.**

While each of the Crystal processes share the standards the rigor involved is dependent on the project and the chosen process. For example, less critical projects suggest two-month incremental delivery time spans whereas critical projects, demanding a rigorous process, may extend time-to-delivery increments to a maximum of four months. Projects are comprised of multiple increments (figure 2). Crystal processes define the functions contained in an increment.

Figure-2



Sources: Authors Compilation

C. Feature Driven Development (FDD)

FDD is a client-centric, architecture-centric, and pragmatic software process [10, 11]. Five main activities in FDD are performed iteratively. Firstly, an overall model is developed in which the initial result will be a high-level object model and notes. At the start of a project, the goal is to identify and understand the fundamentals of the domain that the system is addressing, and throughout the project, this model will be refined out to reflect what is to be built. Secondly, a features list is developed; grouping of them is done into related sets. Third is plan by feature; as the end result are a development, the identification of class owners and the identification of feature set owners is done. Fourth is Design by Feature includes detailed modeling. Fifth is built by feature that includes programming, testing, and packaging of the system.

D. Scrum

Scrum is an agile process most commonly used for product development, especially software development. Scrum is a general-purpose project management framework that is applicable to any project with aggressive deadlines with complex requirements and a degree of uniqueness. In Scrum, projects progress via a series of iterations called sprints. Each sprint is typically 2-4 weeks long. A typical scrum team has between five and nine people, but Scrum projects can easily scale into the hundreds. The team does not include any of the traditional software engineering roles such as programmer, designer, tester, or architect. The product owner is the project's main stakeholder and represents users, customers and others in the process. The Scrum Master is responsible for making sure the team is as productive as possible.

LITERATURE REVIEW

A. Systems Development Methodologies Usage

What are the perceived quality consequences of agile methodology? Agile methodologists and plan-driven methodologists each have perceived very different consequences, resulting in intense debates on the quality impacts of agile methodology. Plan-driven methodology proponents argue that agile methodology leads to quality degradation because the constant changes and adaptation introduce design flaws and coding errors (Paulk, 2001, 2002).

Furthermore, drawing from the Total Quality Management (TQM) discipline, some methodologists argue that agile methodology lacks systematic quality design, quality control, quality assurance, and quality improvement practices, deficiencies that result in the inability to deliver consistent high quality systems over time. In contrast, the proponents of agile methodology argue that many agile practices, such as pair-programming, test-driven programming and continuous integration, have integrated quality control and assurance functionality (Armitage, 2004; Huo, Vemer, Zhu, & Ali Babar, 2004; Opperthauser, 2003).

In addition, they argue that practices like refactoring have integrated quality improvement functionality. Kendall, Kendall, and Kong (2006) suggest that information system quality is highly dependent on the practices and values of the people who develop and implement the systems. Therefore, the quality of information systems is inseparable from the values and practices of the people using agile software development methodology. In addition to the theoretical debates among methodologists, survey studies have examined the perceived impacts of agile methodology on software quality among practitioners. We have found three surveys conducted in the past two years that contain questions concerning the perceived impacts of agile methodology on software quality. We list the details of these three surveys in Table 1.

Table-1: Three Surveys on Agile Software Development

Focus & Sponsor of the Survey	Target Population, Number of Responses & Date of Conduction	Related Findings
To determine how agile processes are being implemented; Sponsored by the Agile Alliance and VersionOne	Summer 2006; VersionOne's customer base and newsletter list; Agile Alliance members; readers of the Agile Journal and some other technology sites; N=722	74% of respondents reported enhanced software quality as one of the values. 86% of respondents reported that software defects were reduced by more than 10%.
To investigate how many people are actually doing the agile development, what they are doing, and whether they are actually benefits from it; Sponsored by Scott Ambler	March 2006 Mailing lists from Dr. Dobb's Journal and Software Development; N=4232	66% of respondents reported higher quality when using agile development. 58% of respondents reported improved satisfaction when using the agile approach.
To assess the state of agile adoption as well as to identify the drivers and barriers towards agile adoption; Sponsored by Digital Focus	October 2005 Agile 2005 conference participants; Agile websites readers; N=136	45% of IT professionals perceive agile development as the solution to scope management. 47% of IT professionals perceive agile development as the solution to addressing unclear business requirements. 17% of IT professionals perceived the agile methodology as the solution to improve code quality.

Sources: Authors Compilation

B. Organizational Culture and Agile Methodology

Methodology adoption is typically initiated either by an organization's internal pulling factors, such as facing a project crisis, a change in development scope and scale, a leadership change, a human resources change, a change in business strategies and structure. It can also be initiated by an organization's external pushing factors, such as new technology, new industry norms, new governmental regulations, or new market opportunities.

Project managers will initiate the adoption process when they perceive the agile software development methodology as a potential solution to development problems. However, the original initiative to adopt the technology does not always lead to its voluntary acceptance by organizational members, limiting the achievement of its intended goals. If the adoption trial does not yield satisfactory outcomes, the adoption attempts are likely to fail. Furthermore, even if the organization decides to adopt the agile

methodology, few organizations completely comply with standard agile methods. From the literature, we have found that organizations usually deploy a combination of methodologies in a pragmatic way. Agile methods are often tailored to fit the needs of the development team.

Researchers have focused on properly altering agile methodology to suit to different organizational and project contexts. A typical type of alteration is to combine plan-driven methodology with agile methodology. For example, Boehm and Turner (2003a, 2003b, 2003c, & 2004) sought to balance agility with discipline. Based on their previous work on risk assessment, they recommend using risk to find the "*sweet spot*" for balancing agile and plan-driven methods; an example of this type of alteration is the combination of the ISO 9000 with the XP. Another typical type of alterations is to combine different agile methods, such as XP and Scrum. A third typical type of alterations is to adopt only part of the agile practices, principles, or values based on specific needs (Beznosov &. Kruchten, 2004; Dagnino, 2002; Fitzgerald, Russo, & O 'Kane, 2003; Keenan, 2004; Theunissen, Kourie, & Watson, 2003; Nawrocki, Jasinski, Walter, & Wojciechowski, 2002).

A few researchers have realized that there are compatibility issues between the agile methodology and organizational culture: agile methodology fits well into certain types of organizational cultures but clashes with other types of organizational culture. Thus far, we have reviewed the important literature on the influence of organizational culture on agile software development. Table-2 provides a list of them.

Table-2: Literatures on Cultural Compatibility of Agile Methodology

Research Direction	Citations
The challenges and impacts of adopting agile methodology on people and organizations	Blotner (2003) Boehm (2002) Ceschi, Sillitti, Succi, & Panfilis (2005) Cockburn & Highsmith (2001) Cohn & Ford (2003) Coram & Bohner (2005) Highsmith & Cockburn (2001) Nerur, Mahapatra, & Mangalaraj (2005) Toleman, Ally, & Darroch (2004)
The agile domain and plan-driven domain	Boehm & Turner (2003a, 2003b, 2003c, & 2004)
The agile methodology alteration (combining agile methodology with plan-driven approaches)	Nawrocki, Jasiński, Walter, & Wojciechowski (2002) Dagnino (2002) Fitzgerald, Russo, & O'Kane (2003) Theunissen, Kourie, & Watson (2003) Beznosov & Kruchten (2004) Keenan (2004)
The compatibility between agile methodology and organizational culture	Boehm (2002) Boehm & Turner (2003a, 2003b, & 2003c) Highsmith (2002a)

Sources: Authors Compilation

AGILE METHODOLOGY AND SOFTWARE QUALITY

What is the impact of agile methodology on software quality? We found this question could be better answered when we separate coding quality (the conformance to system design) from design quality (conformance to user requirements). Nonconformance of codes to software design can be detected by regression testing and by peer review, while nonconformance of software design to user requirements or needs can be detected by user acceptance testing (UAT) and by customer feedback. When requirements are clear and stable, design quality is easy to achieve and the major quality problems arise from coding concerns. When the customer requirements are vague and unstable, the major quality problems arise from design concerns and coding quality becomes minor. Both survey data and case studies data show that agile methodology successfully detects and eliminates design defects and ensures the systems design conforms to user requirements.

From a list of software practices, short releases was chosen as the best practice for facilitating harmony between design and customer need, for being responsive to customers' changing needs, for producing highly valuable products, and for achieving customer satisfaction. Similarly, in our case studies, short releases (also called short releases) was mentioned by many interview participants as the best practice to incorporate customer's inputs and build software that the customer wants. In addition, both our survey and our case studies show that agile methodology is effective in detecting and eliminating coding errors.

In the survey study, from a list of agile practices and plan-driven practices, pair programming was chosen as the best practice for eliminating coding errors, and continuous integration was chosen as the best practice for eliminating design defects. Similarly, in our case studies, participants suggested that intensive, frequent testing is the most effective way to eliminate bugs, and that the agile methodology enables them to test more intensively and frequently. Furthermore, agile practices such as small team and onsite customer improve communication among stakeholders, which effectively prevents and reduces problems with quality. In sum, the results of our survey of software professionals and our case studies of two organizations show that agile methodology is perceived as having positive impacts on software quality.

CONCLUSION

Our case studies have focused on organizational culture and its influence on the use of agile methodology. Although we looked at organizations in two countries, we did not research the cultural differences at the national level. Future research is needed to address how national culture affects the perception and use of agile methodology by developers in different nations since national culture has a strong impact on people's values and beliefs. For example, is the agile methodology better accepted by American software developers or by Indian software developers? What do developers in the United States and India like and dislike about the agile methodology and why? How do we introduce the agile methodology to people of a particular national culture effectively to avoid misconception?

The investigation of these issues will yield interesting findings on the diffusion of agile methodology in nations. Since the adoption of agile methodology introduces structural and cultural changes in organizations, we believe that it is important to study the impact of agile methodology on developer politics or project team power structures as well. Does the agile methodology downplay the importance of management since the team is supposed to manage itself? Does the agile methodology raise the status of technical persons over administrative persons?

We suggest conducting survey studies as well as qualitative studies on the impacts of agile methodology on job satisfaction and team dynamics in the next 5 years. The qualitative studies can help us gain insights and develop models that explain job satisfaction or team performance by various factors, while the quantitative studies can help us verify the models, and dig deep into the issues of developer politics or team dynamics. Search engines are the major approach to proficiently find the desired information from the ocean of knowledge i.e. the World Wide Web. The base of the search process is crawling done by web crawler / crawl bots. The Web Crawling being the first step should be fast and accurate.

Modern Crawlers can retrieve thousands of web pages per second per machine. The basic architecture of a web crawler is the same therefore to achieve higher throughput more advance techniques must be implemented and for this more research is required. Various technological and social issues related to the crawlers should be tackled wisely.

REFERENCES

1. Begel, Andrew, Nagappan, Nachiappan. (2002). Usage and Perceptions of Agile Software Development in an Industrial Context:An Exploratory Study.***In First International symposium on empirical software engineering and measurement,*** pp. 255-264, 2007. Nicholson, Scott. Introduction to Web Databases.

2. Maher, Peter. (2009). Weaving Agile Software Development Techniques into a Traditional Computer Science Curriculum. ***In Proceedings of 6th IEEE International Conference on Information Technology: New Generation,*** pp. 1687-1688.

3. Anfan Zuo, Jing Yang, Xiaowen Chen. (2010). Research of agile software development based on formal methods. ***In Proceedings of the International Conference on Multimedia Information Networking and Security,*** pp. 762-766.

4. Rees, Michael J. (2002). A feasible user story tool for agile software development. ***In Proceedings of the Proc. Of 9th Asia-Pacific Software Engineering Conference*** (APSEC' 02).

5. Salo, Outi, Abrahamsson, Pekka. (2005). ***Integrating agile software development and software process improvement: A longitudinal case study*****,** pp. 193-202.

6. Wang, Ying, Sang, Dayong, & Xie, Wujie. (2009). Analysis on Agile Software Development Methods from the View of Informationalization Supply Chain Management. ***In Proceedings of the 3rd International Symposium on Intelligent Information Technology Application Workshops, (pp. 219-222).***

7. Kar, Nayan Jyoti. (2006, July-September). Adopting agile methodologies of software development. ***SETLabs Briefing, Infosys Technologies,*** 4(1), 1-9.

8. (1999, October). ***Embracing change with extreme programming; beck, kent; IEEE Computer***, pp. 72.

9. (2002, September). ***Agile software development methods; abrahamsson, pekka, salo,*** pp. 39 Outi; VTT Publications ISBN 951-38-6009-4.

10. Livermore, Jeffrey A. (2007***). Factors that impact implementing an agile software development methodology,*** pp. 82-85.(IEEE).

11. ***Feature Driven Development and Agile Modelling,*** Retrieved from http://www.agilemodeling.com/essays/fdd.html

12. Retrieved from http://www.researchgate.net/publication/255707851_Impact_of_Agile_Methodology_on_Software_Developmen...

13. Retrieved fromhttp://www.cs.nyu.edu/courses/spring03/V22.0474-001/lectures/agile/AgileDevelopmentDifferentApproach...

14. Retrieved from http://www.ijctee.org/files/VOLUME2ISSUE4/IJCTEE_0812_09.pdf

15. Retrieved from http://www2.latech.edu/~box/ase/tp_2003/AGILE%20SOFTWARE%20DEVELOPMENT%20PROCESSES.doc

16. Retrieved from http://www.ijstr.org/paper-references.php?ref=IJSTR-1113-7626

17. Retrieved from http://www.researchgate.net/profile/Gaurav_Kumar57/publication/255707851_Impact_of_Agile_Methodology...

18. Retrieved fromhttp://www.agilemodeling.com/essays/fdd.htm

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INSIDER INFORMATION SECURITY THREATS IN INDIAN BANKING CONTEXT

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ABSTRACT

World today is replete with information about attacks on information. Viruses, worms, hackers, and employee abuse and misuse have created a dramatic need for understanding and implementing quality information security. Technological advances in information security have been able to contain and prevent most of the remote threats to information security. Now organizations face a more subtle and greater information security threat: Insider threats. This conceptual paper helps to understand the depth of insider threats and its impact on the banking sector.

KEYWORDS

Banking Security, Information Security Risks, Social Engineering Threats etc.

INTRODUCTION

Information is one of the most important business assets that add value to an organization. Information can exist in many forms. It can be printed or written on paper, stored electronically, transmitted by post or through electronic means, shown on films, or spoken in conversation. Whatever be the form information takes, or means by which it is shared or stored, it should always be appropriately protected (ISO 17799, 2000). Trustworthy employees who have legitimate access to the information, deliberately or accidentally affect bank's business operations. According to Research Foundation (2006), the nature of computer crime has changed over the years as the technology has changed and this has paved way for criminal activities. Although thrill-seeking hackers are still common, professionals who steal information for sale and disgruntled employees who damage systems or steal information for revenge or profit increasingly dominate the field.

Industry analysts now infer that fraud and cyber-crime are the most apprehensive issues facing banks today. Insider attacks is now the banking industry's most pressing problem and reports indicating the severity, frequency, and complexity of these concerns are not uncommon. Bankers now grapple with the pessimistic conclusions and facts indicating that the challenge to curb fraud and cyber-crime may be an elusive one. Reputational risks and economic losses are the greatest effects of insider attacks (Ravich, 2011).

OBJECTIVES OF PAPER

- To understand the research focus and outcomes of prior studies on information security threats in banking enterprises.
- To identify Insider Information Security Threats (IIST) reported in the academic literature specific to banking organizations.
- To identify research gaps in the existing literature on IIST.

CHALLENGES TO TECHNOLOGY ADOPTION IN BANKS

Commercial banks act as financial intermediaries that accept deposits and channel those deposits into lending activities. They provide a safe place to keep excess cash and primarily make money by charging higher interest rates on their loans than they pay for the deposits. The changes that new technologies have brought to banking sector are enormous in their impact on employees and customers. Advances in technology allow for delivery of banking products and services more conveniently and effectively than ever before - thus creating new bases of competition. A successful bank gains vital competitive advantage by having a direct marketing and accountable customer service environment and new, streamlined business processes. Consistent management and decision support systems provide the bank that competitive edge to forge ahead in the banking market place. Banks are aware of customer's need for new services and plan to make them available. Information Technology has increased the level of competition and forced them to integrate the new technologies in order to satisfy their customers. Their effect on banks is particularly multifaceted and has inevitably presented a host of opportunities as well as threats and security concerns (Kantankji, 2008).

There are currently 105 commercial banks operating in the country according to the Reserve Bank of India. (Nationalized banks- 27, State bank group- 8, Private Banks- 30, Foreign Banks- 40). The commercial banks in the country have made tremendous growth since the liberalization of the Indian economy in 1990s. Banks have been at the forefront in innovation and successful implementation of new technology which include modernization of the payment systems, the Automated Clearing House, the

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Credit Reference Bureau, the Real Time Gross Settlement Scheme, Cheque Truncation System, Currency Center Project, and sharing of their Automated Teller Machine (ATM) networks.

Information Security Threats in Banks

Technological advances have increased the levels of vulnerabilities within the banks and increased the avenues for exploitation considering the increasing threats and effects of information attacks. It is now imperative for the banking industry to re-imagine information security as the threats increase in magnitude and complexity. According to a Global Economic Survey (GECS, 2011) carried out in 78 countries to provide a global picture of economic crime, revealed that cases of information security breaches are on the rise. There are more opportunities to commit fraud and more pressure to do so. Ernst and Young's Security survey crime statistics show that a total of 84,842 white-collar crime cases were reported between April and March 2009/10, in leading banks in India marking a 56% increase from 2006. Information security breaches and fraud are increasingly proving to be lucrative opportunities as they now cost the global corporate sector an estimated $388 billion annually. While the larger portion of this cost goes towards the security infrastructures that mitigate the threats, an estimated over 30% is direct cash lost through the information breaches and fraud (Standard Digital, 2012).

External and Internal Information Security Threats in Banks

External threats to information security such as- physical security breaches, network hacking attempts, viruses and spyware attacks, system sabotage, among others (Schultz, 2002) have received wide publicity due to their frequency, complexity and magnitude. However, according to researchers and information security experts, attacks from the inside of the organization are considered more risky and present a bigger threat because insiders have the access and therefore the power to pounce on any vulnerability (Baker et al., 2008). They include sabotage, theft and installation of malicious and unauthorized software, social engineering, and viruses. The insider information security threats, which are the basis of fraud and all other nefarious activities, are not new. As far back as the 1980's, the insider threat was real and a headache for many organizations (United Press International, 1981). According to surveys and research reports, the current or the former employees present the greatest information security threat. Further, the frequency and number of these insider threats have increased exponentially in recent years (Greitzer et al., 2008). Efforts that are more concerted are therefore required to prevent the insider threats from growing to unmanageable proportions, which could lead to widespread economic losses among others for the modern day banks.

INTERNAL INFORMATION SECURITY THREATS (IIST)

According to Brancik (2008), an insider is anyone who has similar access rights into a network, a system, or an application and therefore, an insider can be a current or former employee, a contractor, consultant, a software vendor, or a service provider. Probst, et al (2010) definition removes any technical or I.T. bias; "An insider is a person that has been legitimately empowered with the right to access, represent or decide about one or more assets of an organization's structure." Insider Threat, according to Cole and Ring (2006), is anyone who possesses special access, rights, or knowledge with the intent to of causing harm or danger of any kind is considered an insider threat. If someone is entrusted with authorized access to a system and instead of fulfilling assigned responsibilities, manipulates a system to exploit it, they are considered an insider threat (Einwechter, 2002). Other descriptions postulate that the insider threats are the regular employees, contractors, and consultants who when joining or engaging with the organization are trusted and are given access to confidential resources of the company upon signing a non-disclosure agreement. Some of them are however not skilled enough and may accidentally cause harm or expose the organization to external threats. Others take advantage of their accessibility and deliberately damage or steal confidential information. In either case, these individuals still fall under the 'insider threats' category (Aeran, 2006).Fraud, in the broadest of terms, can simply be defined as obtaining something of value or avoiding an obligation by means of deception and may embrace varied forms of conducts including corporate fraud that involves intricate planning and execution (Duffield and Grabosky, 2001).

Tugular and Spafford (1997) have defined malicious insiders as individuals who are capable of using a computing system at an assigned privilege level, but who use the system in a way that bypasses or exceeds this level, thereby violating their organization's information security policy. There are four groups of insiders according to Cole (2010), they includes pure Insider, Insider associate, Insider affiliate, and outside affiliate.

Aeran (2006) offers an overview of the types of threats and attacks that an organization faces through Insider attacks: They include sabotage, theft, viruses, social engineering, online adult activities and installation of unauthorized software. Schmidt (2011) implores a fundamental review of data security. There certainly have been great advances in the technical countermeasures in the last 10 years that are now available but it is still unclear whether we are less vulnerable to fraud and data security breaches. He also implies that the whole concept of 'security' may be a nebulous one; given the recent high profile fraud and security breaches. Further, the banking sector has generally been compelled in recent times to adapt to the unremitting business requirements, largely due to the high rate of advancements in information systems. These have however also opened up many avenues of data exchange and further exacerbated the complexities caused by sharing of data through the various channels, making it more difficult to protect data (Killmeyer, 2006).

Characteristics of an Inside Attacker

Identifying an inside attacker is a great challenge as Schultz (2008) highlights, to a great extent due to the approach of traditional strategies of information security. This is because much of their behavior in the course of an attack will superficially appear to be normal. Intrusion Detection Systems for instance would usually not issue alerts, as they could constitute false alarms.

Schultz (2002) further proposes that since many of the behaviors and activities of inside attackers are superficially innocuous, banks should construct profiles for all the insiders. This includes employees, consultants, service providers, and contractors. Despite the potential impact in helping to identify inside attackers through use of such profiles, most banks are generally hesitant when it comes to using them. Insider security threats may be one of the following types according to Aeran (2006). Sabotage carried out with the chief aim of disrupting the organization's operations. A disgruntled employee may sabotage the organization's systems to take revenge. Theft involves stealing of the organizations intellectual property, which is of commercial value. This could be information on computers, hardware, confidential documents, software code, customer records or financial data. Installation of malicious software code: software programs written with the sole aim of harming the organization's information systems. Examples include "time bombs" and "logic bombs". Viruses: harmful programs, which have destructive payloads when executed. They are spread throughout the organizations through E-mails, chats, information relays, file transfers, and removable drives. They may be activated deliberately or accidentally. Social engineering: the practice of obtaining confidential information through the manipulation of legitimate users. Social engineers trick employees into revealing sensitive information or having them do something that is against organization policy. Online adult activities: Adult and pornographic content are famous for propelling spywares and viruses. These online adult activities therefore make the information systems vulnerable to attacks. Installation of unauthorized software: software that are not installed by the I.T. department and can gather personal information of users and destroy data stored in computers. They include Trojan, spyware, and Key loggers. Shaw, Post and Ruby (2005) infer that despite the studies and the analysis of the subjects who had committed the insider attacks, the characteristics pose serious management challenges. Information Technology professionals for and other individuals for instance may be honest and law abiding citizens and only commit these malicious acts when subjected to high levels of perceived personal or professional stress. However, they identified six personal characteristics with direct implications for risk: A history of personal and social frustrations, Computer dependency, Ethical flexibility, reduced loyalty, a sense of entitlement, and lack of empathy.

Detection of insider attacks is often a difficult and elusive task until the potential damage or loss is obvious as Schultz (2002) notes. This is partly because of the traditional reactive approaches. However, several predictive models of insider characteristics and behavior, most of which are empirically deduced, have been proposed and are usually easily overlooked, partly because of their subtle nature. They include personality traits (introversion, depression and weaknesses in handling stress/conflict), verbal behavior, across system usage patterns (unusual usage patterns), negative work environments, preparatory behavior (reconnaissance activity), meaningful errors (errors that indicate malicious intent) and deliberate markers left behind by the attackers. In mitigating the insider security threats, approaches, which are of technical and nontechnical, have been used. Carroll (2006) states that regulatory compliance is forcing organizations to reconsider how risk management is approached; internal policy is the base for regulatory compliance and insider incident prevention. Policy defines and governs actions and behaviors of personnel within an organization. However, policy by itself is not very useful if it not backed by consequences. These consequences have the greatest impact to the insider threat.

RELEVANCE OF IIST

The Concept of Insider Information Security Information security, according to Brotby (2008), has imperatively become a matter for consideration at the highest organizational levels. Given the effects of fraud and data security breaches, it is no longer only a technical issue, but a business and governance challenge as well that involves risk management, reporting and accountability. On the subject of information systems and data security, the overwhelming majority of the available literature generally covers the technical aspects and specifically, the external threats more than the insider threats. The available literature on internal however has not failed to highlight this unbalanced approach to data security as one of the major reasons insider threats remain unchecked or unmitigated.

Increasing user awareness will reduce unintentional insider threats. This approach to information security as Rudolph et al (2002) argues will enhance detection of insider threats. They argue that employees who are aware of security concerns are able to prevent incidents. Employees can become detection instruments of the organization by familiarizing with the danger signals through awareness programs. Additionally, these employee awareness programs also have the advantage that they help develop positive effects on their attitudes and beliefs towards compliance with information system security policies (Bulgurcu et al., 2010, D'Arcy et al. 2009).

There are four types of Insiders according to Cole (2010): Pure Insider: an employee with all the rights and access that are associated with being employed. They can cause the greatest damage because they possess most of the access they need. Insider associate: someone with limited authorized access. They are not employees of the organization and do not require full access, but they do need limited access. Guards, cleaners, contractors, and third party service providers all fall in this category. Insider affiliates: Individuals who use the employee's credentials to gain access. This may be a friend, spouse, or client of the employee.

Outside affiliates: Non-trusted outsiders who use open and vulnerabilities to gain access to organization's information resources, either virtually or physically.

According to Anderson (2012), to an average insider intent on causing harm or stealing data, the modern day office reads like an open book. While trends in threat models may be predictable, the insider threats and attacks persist in exposing the "low hanging fruit" or vulnerabilities in our office environments. Daily and simple exposures like, looking at a computer screen without authorization, are usually taken for granted and often lead to data leakages used in fraud. Capelli (2012) further implores that even as organizations become concerned about the malicious insider threats, they must also pay due attention to the emerging trends such as the malicious outsider taking advantage of the inadvertent insider.

IIST IN BANKS

The insider threat has for far too long been overlooked by many banks when conducting their risk and threat analysis assessments. For the banks that endure the most of the insiders' nefarious activities, reputational and financial risks are quite high. The cost of ignoring preventative solutions in the long run is comparatively much higher (Brancik, 2008). Insider threats and risks require assessment, prioritization and, most of all, action rather than reaction. Cole (2008) crystallizes the issue: The insider threat is like a tumor. If you realize there is a problem and address it, you will have short-term suffering but a good chance of recovery. If you ignore it, it will keep getting worse and while you might have short-term enjoyment, it will most likely kill you. While it may be often difficult and even impossible, banks should ideally be able to predict and circumvent insider attacks, much like the way clandestine government agencies are able to sniff out and thwart the actions of potential spies through profiling them as Schultz (2002) observes. Like many other crimes, fraud which is perpetrated mainly by insider involvement can be aptly explained by three major factors; a supply of motivated offenders, the availability of suitable targets, and the absence of capable guardians and control systems. A combination of these three major factors lays the ground for all insider attacks (Cohen and Felson, 1979).

Despite the prevalence of the insider threat problem in the modern day banks, there is little systematic study of vulnerable insiders and majority of resources are still being channeled to the development of technologies to detect and prevent external threats. In addition, the insider threat is essentially a human problem, and human problems cannot be solved with technological solutions. Therefore, insider risk must be assessed and managed if the banks are to make any headway in mitigating its vulnerability to fraud, espionage, or sabotage by those who know the system too well: insiders (Shaw, Ruby and Post, 2005).

In the banking and financial sectors, some studies such as one conducted by Randazzzo, Moore, et al (2004) has inferred that most incidences of fraud and insider attacks were not technically sophisticated. That is, they involved exploitation of the non-technical vulnerabilities such as basic business rules and organizational policies rather than vulnerabilities in the information system or network. Most incidents did not require technical wherewithal, further reiterating the importance of organizations to secure their data from the full range of users. That is, from system administrators, basic users responsible for data entry, employees offering support services, and even associates who provide services.

IIST GOVERNANCE AND CHALLENGES

A report on the trends of fraud in 2010 highlighted some of the types of threats facing banks because of Insider attacks. They included Cheque fraud, card (ATM, Debit and Credit), Forgery, Wire Transfers, Counterfeiting, Identity theft, Embezzlement, and Loan Fraud among others. This means that the opportunities for Insider attacks have increased as the organizations' vulnerabilities are exploited as most of the fraud cases involve bank staffs (Ernst & Young- Security survey- 2009). Since an 'insider' possesses information, capabilities and knowledge not known to others like the external attackers, they are considered the chief challenge in securing information resources in the organization. The impact of the insider threats can occur in several dimensions such as financial loss, disruption to the organization's operations, loss of reputation, and even long-term impacts on the organizational culture (Probst, et al, 2010). Cole and Ring (2006) report that, while not many executives will boldly admit that it is easier to trust your employees and keep life simple, than to suspect everyone and deal with the complexities it creates, the amount of losses corporations lose as a result of insider attacks might compel them to think differently.

According to Information security experts like Anderson (2012), new legislation has made it easier to prosecute and punish offenders. However, the chief challenge remains how to prevent the insider attacks. Because of the growing complexity of the attacks, most insiders are able to effectively cover their tracks and nearly impossible to detect. Probst, et al (2010) further explains that Insider behavior may be close to the expected behavior and therefore very difficult to distinguish. He notes that forensics tends to be highly undeveloped when it comes to addressing insider threats and still often, the audit trails are generally insufficient.

According to Whitman (2004), acts of "human failure" or "errors" are one of the most severe threats to information security. Arguably, the two most prevalent unintentional insider threats, user errors and negligence, expose the organization to external threats. Some of the underlying reasons normally attributed to user errors are; lack of experience in using security tools, complexity of the security tools, and job stress due to time pressure and workload. On the other hand, although reasons behind negligence are complex, lack of awareness and motivation to use security tools due to their performance hindering characteristics

can be considered as important factors. Thus, Whitman proposes to mitigate user error and negligence through five mechanisms: motivation, training, usability of security tools, time and workload pressure, and awareness.

Maxim (2012) argues that the insider threat today can range from the disgruntled employee with a technical capacity to embed an attack to a salesperson defecting to a competitor and bringing a price list with him. Organizations therefore need to realize the severity and the reality of the insider threat challenge. Careless or inadvertent actions also represent another significant insider threat vector. He further notes some of the macro trends that are aggravating the frequency and intensity of insider threats as: Low data storage costs: The continuing drop in data storage costs means that it is often cheaper for organizations to store and archive all data rather than spending time examining it to determine what should be saved or deleted. The low storage costs means that data is always accessible, so if malicious insiders are looking for data, they can find it. Increased sophistication of attacks: Not surprisingly, individuals with technical acumen are often the ones committing insider attacks. If they have the skill to conduct the attack, it also means that they also likely possess the skills to cover up the theft, either by modifying/deleting log files or other actions. A highly distributed work force: Today, employees are much more distributed and access data and applications over multiple channels (Wi-Fi, Ethernet and 3G) from multiple platforms (PC, smart phone, tablet, kiosk). Organizations need to support these multiple access methods to keep workers productive, but each new channel and platform introduces a new set of potential risks that must be managed. When other factors like cloud computing and outsourcing are factored in, the unfortunate reality is that data is essentially everywhere. Inadequate end-user awareness: Many employees simply lack knowledge of the organization's policies on information use as well as how data is to be used, shared and distributed. This can lead to actions such as users emailing confidential documents to a wide distribution. These instances are not driven by malicious insiders but can be just as damaging to an organization as a malicious insider. Organizations have attempted to combat the insider threat, but these approaches have generally focused only on detecting outright fraud - for example, controls are implemented to ensure proper segregation of duties within a financial application. Organizations seeking to mitigate insider threats face three other challenges. First, the sheer volume of audit and log data impedes forensics investigation and detection. Logging all IT activity is an important first step in combating insider attacks and today is highly distributed and complex IT environments generate massive volumes of logging data, but the sheer volume of data is very difficult to manage. Secondly, most current approaches to addressing insider threats are reactive, not predictive. This helps immensely in forensic investigations, but the problem is that the attack or theft has already occurred. Therefore, organizations should be looking for solutions that can provide more analytic and predictive capabilities that if not able to prevent insider attacks, may still identify "at-risk insiders" and then implement more detailed logging on those individuals in response. IT managers need to balance the risk of employees' need for additional access versus the lost productivity that would result if access were not granted to certain users. Many organizations also lack the necessary reporting tools to examine an individual's expanding entitlements over time, which further compounds the problem. The result is that IT often struggles to answer the critical question, "Who has access to what?" confidently and accurately.

CERT (2009) posits that insider threats potentially pose the greatest harm to an organization. Since Insiders possess significant advantage over others who might want to harm the organization, they can bypass both the physical and technical data security infrastructures designed to prevent unauthorized access. Most data security measures such as intrusion detection systems, electronic building access systems, and firewalls are primarily designed to mitigate external threats. Insiders are aware of their capabilities as well as their flaws and vulnerabilities and are therefore complicit in fraud and other data security breaches. Insiders will know how, when and where to attack and how to cover their tracks.

Maxim (2012) proposes that, organizations must come to task with the reality of the insider threat if they are to effectively mitigate the effects. Insider attacks are significant threat and are increasing in complexity. Banks must confront the reality that nothing may completely prevent all insider attacks, but only those who adopt aggressive proactive approaches can help to reduce the risk.

Mitigations to IIST

The challenge of data security in combating fraud is one of a complex and interdependent nature as James (1996) highlights. It must be approached comprehensively and all the elements that are interrelated considered. The human element for instance has further compounded the situation because of free will; they will always act in their best interests. According to Rudolph et al. (2002), Information security must now be seen as a people problem rather than the conventional technical approaches like sophisticated equipment and complex software solutions. The increasing numbers of breaches have proved this fact, that is, an organization's security status is only as strong as the weakest link and if users do not recognize technological controls, information systems will be compromised.

Aeran (2006) suggests that an understanding of the motivations for the insider attacks will also aid in establishing key characteristics of the Insiders if not help in averting the attacks altogether. The following factors may motivate the insiders to carry out attacks either independently or as a combination: Financial gain, disgruntlement, espionage, Revenge, curiosity and quest for a challenge, emotional distress and desire for respect, decision failures, and mental disorders.

Technical Approaches to Mitigation of IIST

Technology-based control mechanisms will reduce intentional insider threats to the information security level. Haugen and Selin (1999) point out some of the most common technology based preventive controls as passwords, firewalls, connection security, and cryptography. Sandhu (2002) argues that password-based authentication is one of the persuasive technologies that can be implemented as a control mechanism. He further postulates that though they are not as secure as biometric systems, they can be strengthened to be used for the less critical processes within the organization. Brussin (2002) states that, as with passwords, firewalls have become one of the most conspicuous security technologies used in many organizations. Einwetcher (2002) points out that, intrusion detection systems are also considered as effective detective controls since they are not only used to detect attacks, but also identify and analyze attack trends. According to Chokhani (2002) and Bace (2002), some of the more advanced technology based controls that can be implemented are public key infrastructures, certificate authorities and vulnerability assessments.

RESEARCH GAPS

The current dynamic technological advances have helped increase the importance of electronic information. Banks now perform most of their day-to-day business activities electronically and this has resulted in drastically changed level of information security threats. In response to increasing recognition of the dangers posed by insider threat to information systems in Indian banks:

- A study to improve the understanding of the personality, motives and circumstances, which contribute to information technology insider actions, will be of benefit to banks and other financial institutions.
- A research to study how commercial banks could manage the access and prevent insider threat activities is required.
- A study to identify the level in the Organizational structure, which is more vulnerable to Insider, attacks.

Techno savvy staff can exploit opportunities arising from the system knowledge to cause more harm to the banks. The challenges encountered by banks in implementing the insider threat mitigating strategies are of concern today. A research on the challenges and how banks can overcome them will be a big contributor in ensuring that the current gaps are sealed.

CONCLUSION

Financial gain is highlighted by existing studies as the single most prevalent motivation for insider threats in a bank's experience. The most prevalent type of insider threats in commercial banks was pure insiders. Staffs within the organization have the rightful access to information, which they use, for their benefits. This creates a clear picture to commercial banks that the threat from within is more and requires to be addressed if insider threat was to be effectively controlled. Banks must therefore have paradigm shifts as far as the insider issue is involved. Rather than the traditional approach of sophisticated equipment and complex software solutions, the insider issue must now be seen as a people problem (Rudolph, et al., 2002). Strategies should be developed to mitigate insider threats in banks.

Previous studies on insider information security threats have highlighted the various types of insider attack, forms of insider threats and various types of insiders. Substantial studies contributing to insights in the field has provided the characteristics and trends of insiders and clarity on the behaviors to watch. In mitigating insider information security threats, though several approaches have been suggested, strategies in mitigation insider threats still remains elusive , hence the basis of predicting and monitoring the potential activities leading to the vice and control approaches leaves room for more investigations to be done.

In the Indian banking sector, knowledge of the prevalent type of insider threats will be essential to enable the banks to focus more on controlling the consequences of insider attacks. Technological advances embraced by Indian banks continue to open up more opportunities for insider attacks. Comprehensive solutions should now be sought to address Information Security concerns like the Insider attacks.

The existing gaps pose an important issue in the Indian Banking context. We continue our research to contribute to the body of knowledge and offer practical advice to compact this threat.

REFERENCES

1. Aeran, Ankur. (2006). ***Comprehensive overview of Insider Threats and their controls.*** Retrieved on 18 August, 2014 from www.cccure.org/Documents./InsiderThreatsReport.pdf

2. Bace, R. G. (2002). Vulnerability assessment and intrusion detection systems. In S. Bosworth and M. E. Kabay (Eds.), ***Computer Security [Handbook]*** (4th Ed.). New York: John Wiley and Sons, Inc.

3. Baker, W. H., Hylender, C. D., & Valentine, J. A. (2008). ***2008 Data Breach Investigations.***

4. Brown S. (2002, May). ***Uncloaking the Insider Threat***.

5. Brussin, D. (2002). Firewall and proxy servers. In S. Bosworth and M. E. Kabay (Eds.), ***Computer Security [Handbook]*** (4th Ed.). New York: John Wiley and Sons, Inc.

6. CERT. (2009). ***Common Sense Guide to Prevention and Detection of Insider Threats*** (3rd Ed.). Version 3.1. Retrieved on June 10, 2014 from www.cert.org/archive/pdf/CSG-V3.pdf

7. Cole, E., & Ring, S. (2006). ***Insider Threat: Protecting the Enterprise from Sabotage, Spying, and Theft***. Syngress Publishing.

8. Cohen, L., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. ***American Sociological Review***, 44, 588–608.

9. Cole, Eric. (2010). ***Different Flavors of the Insider Threat***. Retrieved on July 04, 2014 from http://www.darkreading.com/blog/227700748/different-flavors-of-the-insider-threat.html

10. Price, Waterhouse Coopers. (2011). ***GECS*** (Global Economic Crime Survey). Retrieved on June 15, 2014 from www.pwc.com/crimesurvey

11. Haugen, S., & Selin, J. R. (1999). Identifying and controlling computer crime and employee fraud. ***Industrial Management and Data Systems***, 99(8), 340-344.

12. Whitman, M. E. (2004). In defense of the realm: Understanding the threats to information security. ***International Journal of Information Management,*** 24, 43-57.

13. Retrieved from http://www.slideshare.net/STO_STRATEGY/to-get-round-to-the-heart-of-fortress-30727148

14. Retrieved fromhttp://ddc.aub.edu.lb/projects/business/it-banking.html

15. Retrieved fromhttp://www.ca.com/us/~/media/Files/whitepapers/dealing-with-insider-threats-to-cyber-security.pdf

16. Retrieved fromhttp://in.linkedin.com/in/anuragamrit

17. Retrieved fromhttp://digitalcommons.kennesaw.edu/facpubs/1429

18. Retrieved fromhttp://www.ccrg.ox.ac.uk/datasets/secpolicy.pdf

19. Retrieved fromhttp://www.eca.co.in/services/management-system-certification/iso-270012005

20. Retrieved fromhttp://www.dm.usda.gov/ocpm/Security%20Guide/V1comput/Threats.htm

21. Retrieved fromhttp://www.tech-florida.com/SECURITY%20THREATS.htm

22. Retrieved fromhttp://rahulmg.blogspot.in/2008/08/computer-threats-top-10.html

23. Retrieved fromhttp://blog.emagined.com/2008/12/01/predicting-detecting-and-responding-to-insider-attacks

24. Retrieved from http://www.opleidingen.ugent.be/studiegids/2007/EN/FACULTY/EB/COURSE/FNACCA/01000005/INDEX.HTM

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DESIGN AND PERFORMANCE ANALYSIS OF AN ANTENNA WITH DEFECTED GROUND STRUCTURE FOR COGNITIVE RADIO APPLICATIONS

M. S. Narlawar[19] Dr. S. L. Badjate[20]

ABSTRACT

With development of communication technology, size reduction of microstrip antenna is becoming an important design consideration for practical applications. So, a microstrip-feed circular monopole antenna (CMA) with defected ground structure is proposed for cognitive radio applications, which is modified further to reduce the dimensions of the patch for comparatively lower frequencies.

The design considerations for achieving wideband and reconfiguration of the proposed antenna are also discussed. Most of the work in cognitive radio domain has been done in the frequency range of 3.1GHz to 10.6 GHz, but this paper presents a Circular Monopole Antenna (CMA) operating over frequency band of 0.6GHz to 3.58GHz. The proposed antenna was designed and analyzed by using software HFSS (High frequency structure Simulator) 13.0. The proposed antenna uses FR-4 substrate having thickness of 1.6mm and dielectric constant of 4.4. This antenna achieves an impedance bandwidth of 2.98GHz. Antenna performance parameters such as antenna gain, return loss, VSWR, Input impedance, reflection coefficient over the operating bands have been observed and found to be well within the desired range. The simulated results of the proposed design found in close conformity with the measured results of its fabricated counterpart.

KEYWORDS

Cognitive Radio, Ultra Wideband, Defected Ground Structure, Sensing Antenna, Reconfigurable Antenna etc.

INTRODUCTION

The rapid growth of communication systems and the increase in demand for frequency bands have caused a shortage in the available RF spectrum. Current spectrum allocations are highly under-utilized where it is found that the spectrum can be idle for 90% of the time [12]. Cognitive radio system based on software-defined architecture aims to improve the spectrum utilization by changing the transmitter parameters based on the interaction with the environment in which it operates [12].

Cognitive Radio

A cognitive radio is an intelligent communication system that is able to learn from the environment and adapt to the variations in its surrounding by adjusting the transmit power, carrier frequency, modulation strategy or transmission data rate. Therefore, the main objective of a cognitive radio system is to ensure highly reliable communication whenever and wherever needed [7].

For cognitive radio applications, both, a Wideband antenna for channel sensing and reconfigurable antennas for communication are required [7].

Reconfiguration of Antenna

Reconfigurable antennas have become more attractive with the increasing demand for multiband antennas. They provide more levels of functionality to a system by eliminating the need for complicated wideband antenna solutions. Common antenna designs not involving re-configurability impose restrictions on the system performance because of their fixed structure. However, reconfigurable antennas can enhance their performance by providing the ability to adapt to new operating scenarios.

The concept of reconfigurable antennas refers to a change in the frequency characteristics, radiation pattern, impedance bandwidth and polarization of an antenna by changing its aperture dimensions or geometry through electrical or mechanical means.

Antennas with reconfigurable frequency response (also known as tunable antennas) can either switch abruptly from one frequency band to another or continuously perform this task. The frequency response re-configurability is achieved by actively controlling the effective electrical length of the antenna thus enabling the antenna to operate in different frequency bands. This is usually done by adding or removing a part or parts of the antenna through electrical, mechanical, optical, or other means.

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Defected Ground Structure

In today's modern mobile, satellite and wireless communication systems, demand for smaller low-cost antenna has been increased largely. In order to support high mobility, a compact and light weighted antenna is needed.

Defected patch structure (slit or slot in patch) is used to reduce size of antenna. Defected patch structure is realized by etching the conducting patch and defected ground structure is realized by etching the conducting ground plane of microstrip antenna. This disturbs the field current distribution in the plane, which influences the input impedance and current flow of the antenna. The geometry of defected patch structure can be one or few etched structures, which is simpler and does not need a large area to implement it.

This paper presents a reconfigurable circular monopole antenna with defected ground structure for cognitive radio applications. The paper is divided as section II that presents an objective of the paper, section III presents the design procedure of antenna. Section IV presents the proposed antenna design and simulated result and finally section V presents the conclusion and future scope.

OBJECTIVES OF STUDY

The objective of the proposed paper is to design an antenna for cognitive radio applications which should be ultra wide band and reconfigurable, and to evaluate the performance of an antenna. Several factors need to be considered while designing the antenna, including bandwidth, radiation pattern and return loss. The antenna performance parameter is expected to have the values in following range:

- 50Ω input impedance,
- VSWR between 1 and 2,
- Return loss -10db in the desired range,
- Sensing antenna should be Wide-band with Omni directional radiation pattern,
- Communicating antenna should be reconfigurable for narrow bandwidth with directional radiation pattern.

DESIGN PROCEDURE FOR AN ANTENNA

The proposed circular monopole antenna is shown in Figure-1, and the design parameters are calculated using the following procedure.

Radius of patch (A)

The size of CMA can be calculated via the following equations [10]:

$$f_L = \frac{c}{\lambda} = \frac{7.2}{(2.25A + P)} GHz$$

$$L=2A \qquad (1)$$

Where f_L=800MHzis the lower band-edge frequency, *P* is the length of the 50Ω feed line in cm, which has been optimized for this design to 1.8mm , and the approximated value of εeffis given by[10]:

$$\varepsilon_{ff} = \frac{\varepsilon_r + 1}{2} \qquad (2)$$

ε_{eff} =2.7

$$k = \sqrt{\varepsilon ff}$$

$$k=1.64 \qquad (3)$$

For FR4 substrate with thickness of 1.6 mm and *εeff* =2.7 and *L* is length of CMA, then using equation (1) with P=1.8mm, f_L=800MHzwe get radius A=4cm.To keep margin in f_L, radius is chosen as 4.5cm (45mm).

Microstrip Line Width (WStrL)

The microstrip line width has been calculated from the following equation [10]

$$z_0 = \frac{87}{\sqrt{\varepsilon_r + 1.41}} l_n \left(\frac{5.98h}{0.8Wstrl + t} \right) \qquad (4)$$

Where Z_0 is the characteristic impedance of the microstrip line, h is the substrate thickness, which has been taken to be 1.6mm as a typical value, t is the metallization thickness, which is 0.035mm, Wstrl is the microstrip feed line width and $\mathcal{E}_r$ for FR4 substrate is 4.4. Therefore using equation (4), for the characteristic impedance of 50Ω, Wstrl will be equal to 3mm.

Ground Plane Length (Lg)[10]

$$Lg = \frac{\lambda}{4} = \frac{c}{4kf_L} \qquad (5)$$

Where $k = \sqrt{\varepsilon_{eff}}$

For f_L= 800MHz, *εeff* =2.7, we have calculated the value of Lg which is approximately equal to 50mm.The radiated patch occupied a total volume of 110 × 160 ×1.6 mm.

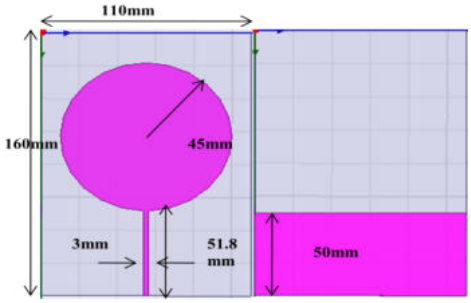
CIRCULAR MONOPOLE ANTENNA WITH MICROSTRIP FEED LINE

In this section, we discuss antenna designs for underlay Cognitive Radio. We start by studying techniques employed in the design of monopole antennas. Basically monopole antenna can be designed by using partial ground plane and coplanar waveguide structure.Bandwidth can be increases by incorporating DGS. By incorporating switches reconfiguration can be obtained. Such wideband antennas are used for channel sensing and narrowband antennas are used for communication in CR.

Circular Monopole Antenna (CMA)

The proposed circular monopole antenna can be designed by using partial ground plane, which is shown in Figure-1. The circular monopole antenna with radius 45 mm, a 50 Ω microstrip feed line are printed on one side of the FR4 substrate. The length and the width of the dielectric substrate are 160x110 mm. The width of the microstrip feed line is fixed at 3mm to achieve 50Ω impedance.

Figure-1: Geometry of Proposed CMA



a. Top View **b. Bottom View**

Sources: Authors Compilation

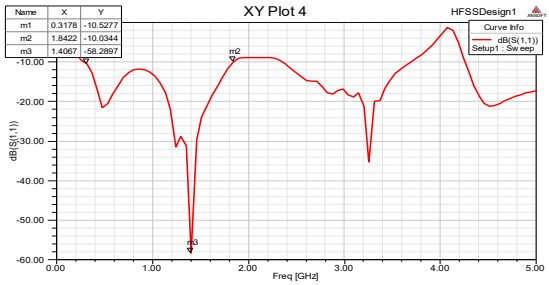
The proposed antenna dimensions are tabulated as:

Table-1: Proposed Antenna Dimensions

Parameters	Dimensions(mm)
L(mm)	160mm
W(mm)	110mm
W_{strl}(mm)	3mm
p(mm)	1.8mm
A(mm)	45mm
L_G(mm)	50mm

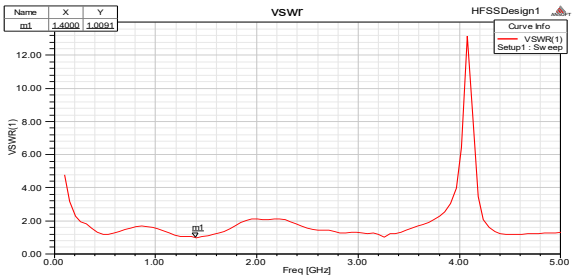
Sources: Authors Compilation

Figure-2: Return Loss Plot of CMA



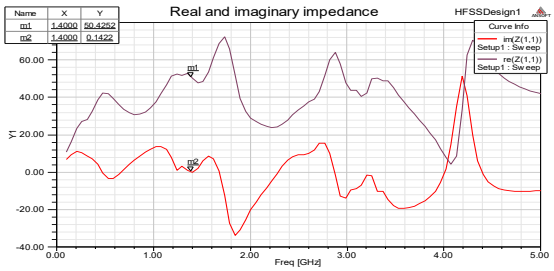
Sources: Authors Compilation

Figure-3: VSWR plot of CMA



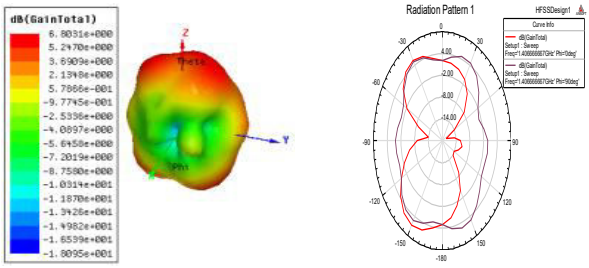
Sources: Authors Compilation

Figure-4: Impedance plot of CMA



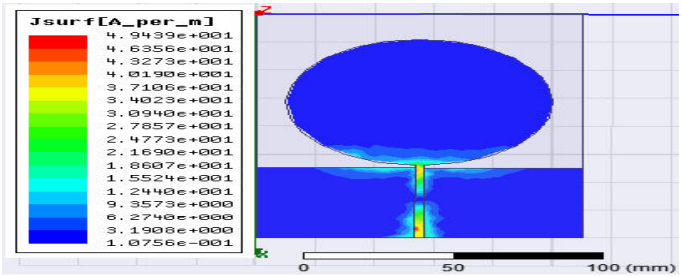
Sources: Authors Compilation

Figure-5: 2D & 3D Radiation Pattern



Sources: Authors Compilation

Figure-6: Surface Current Distribution at 1.4 GHz



Sources: Authors Compilation

CMA operates in the frequency range of 0.31GHz to 1.84 GHz so the bandwidth is equal to1.53 GHz or 142.32%.

Size reduction of patch using slit

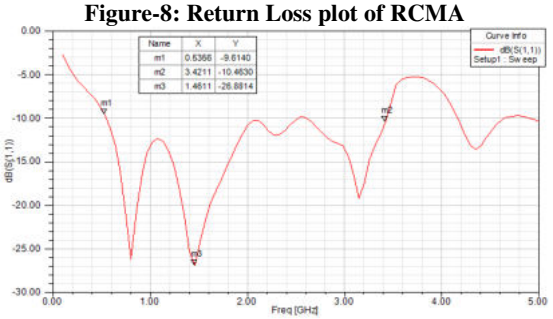
It is very clear from the surface current distribution of CMA from Fig.7, that there is very less current in the upper portion of CMA so by incorporating slit in patch we can reduced the patch size to some extent and achieves the broad bandwidth without disturbing the radiation pattern.

Figure-7: Geometry of Reduced Circular Monopole Antenna (RCMA)

a. top view **b. bottom view**

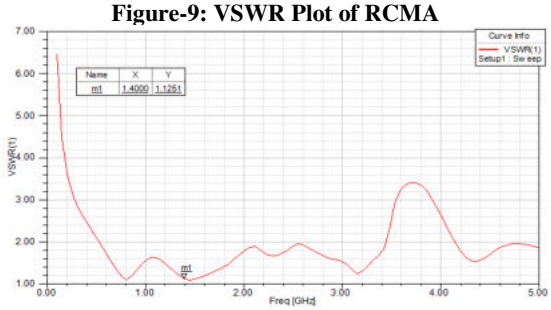
Sources: Authors Compilation

Figure-8: Return Loss plot of RCMA



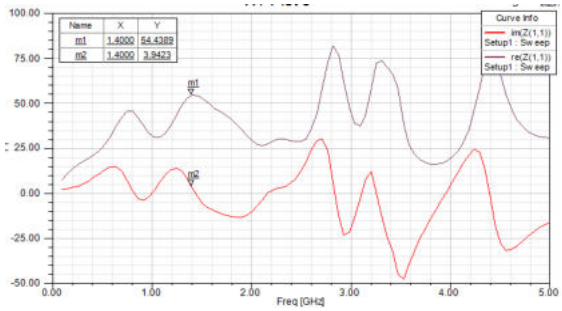
Sources: Authors Compilation

Figure-9: VSWR Plot of RCMA



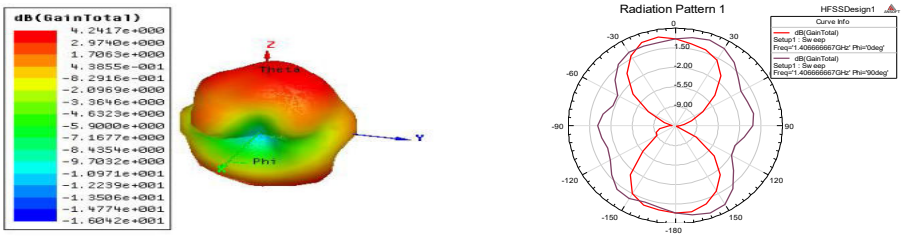
Sources: Authors Compilation

Figure-10: Impedance Plot of RCMA



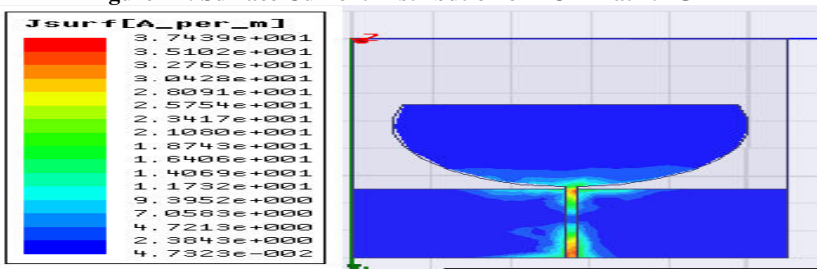
Sources: Authors Compilation

Figure-11: 2D & 3D Radiation Pattern of RCMA at 1.4 GHZ



Sources: Authors Compilation

Figure-12: Surface Current Distribution of RCMA at 1.4 GHz

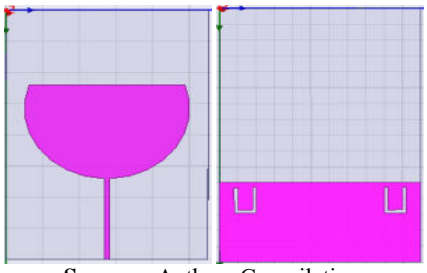


Sources: Authors Compilation

With Reduced CMA i.e. by incorporating slit in the patch, the operating frequency range is from 0.54 GHz to 3.42 GHz i.e. the bandwidth is increased to 2.87 GHz. Thus, along with reduction in size of the patch the bandwidth has increased to 187.58% as compared to CMA.

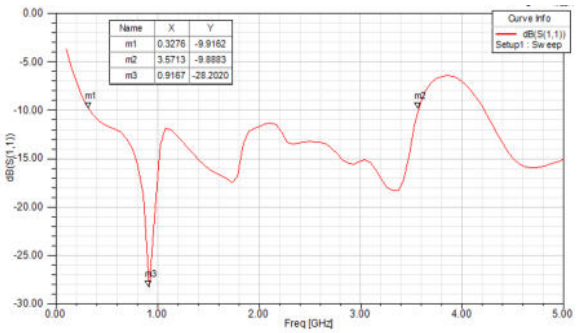
Geometry of Circular Monopole Antenna with Slit and DGS

Figure-13: Geometry of RCMA with DGS



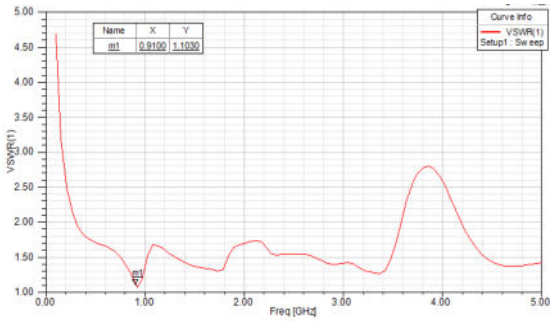
Sources: Authors Compilation

Figure-14: Return Loss Plot of RCMA with DGS



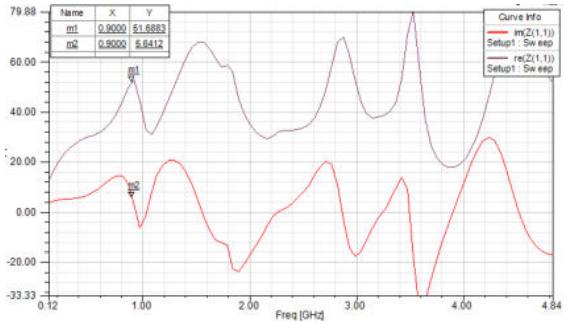
Sources: Authors Compilation

Figure-15: VSWR Plot of RCMA with DGS



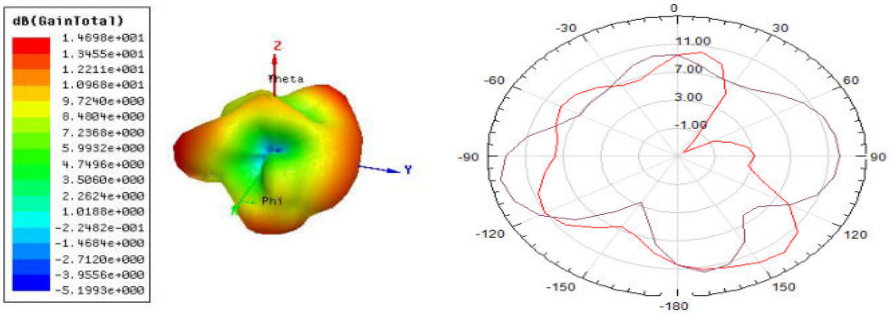
Sources: Authors Compilation

Figure-16: Impedance Plot of RCMA with DGS



Sources: Authors Compilation

Figure-17: 2D & 3D Radiation Pattern of RCMA with DGS

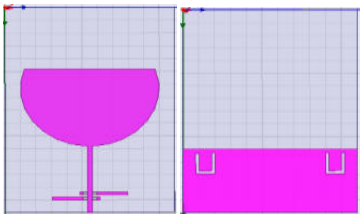


Sources: Authors Compilation

By incorporating slits at appropriate location after extensive parametric analysis has further improved the bandwidth from 2.87 GHz to 3.25 GHz i.e. in the range of 0.327 GHz to 3.57 GHz. Thus, there is further increase in band width by 113.24% when compared with Reduced CMA and an increase by 212.42% when compared with CMA. But, in this case it is clear from the 2D and 3D Radiation pattern that the omni-directionality of the antenna has got disturbed to some extent.

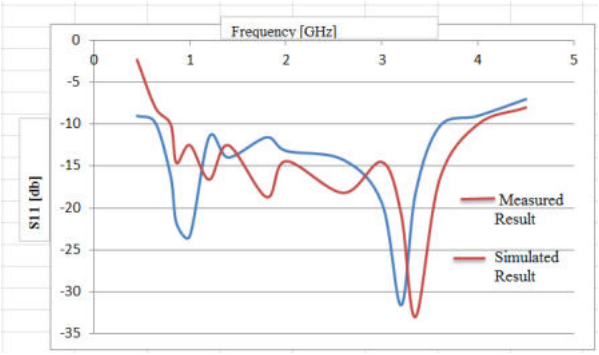
Geometry of Circular Monopole Antenna with Slit, Dgs, Four Stubs and Switches

Figure-18: Geometry of CMA with slit, dgs, Four Stubs and all Four Switches in Off Position
Case 1: All Switches S1, S2, S3 & S4 are in off Position (sensing antenna)



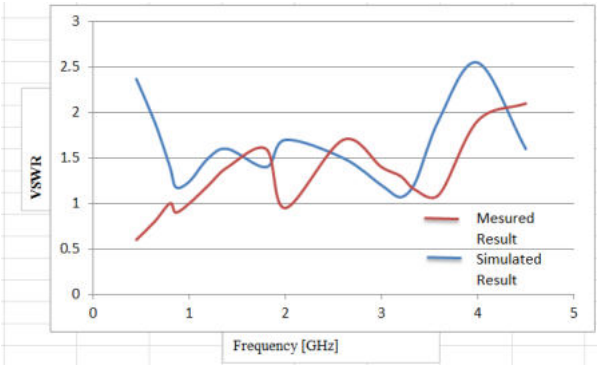
Sources: Authors Compilation

Figure-19: Comparative Return Loss Plot of RCMA with DGS & Stubs with all Switches in off Position



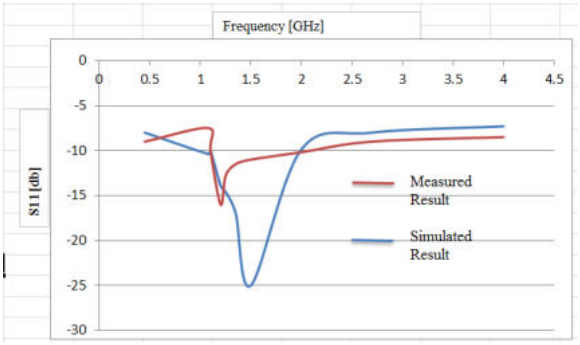
Sources: Authors Compilation

Figure-20: Comparative VSWR Plot of RCMA with DGS &Stubs with all Switches in Off Position
Case 2: s1 and s4 are on, s2 s3 are off



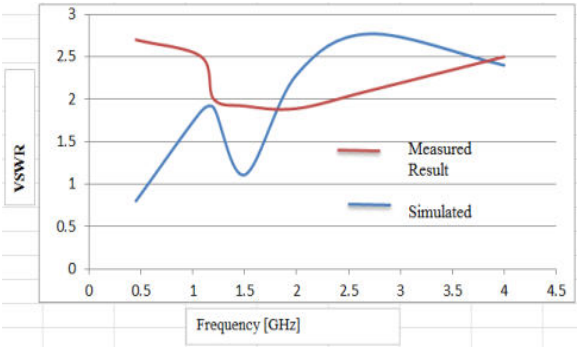
Sources: Authors Compilation

Figure-21: Comparative Return Loss Plot of RCMA with DGS & Stubs with
Switch s1, s4 in on Position & s2, s3 in off position



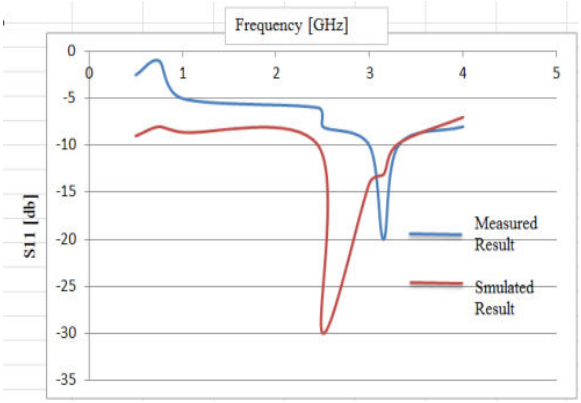
Sources: Authors Compilation

Figure-22: Comparative VSWR plot of RCMA with DGS & stubs with switch s1, s4 in on position
& s2, s3 in off position
Case 3: s1 in off and s2, s3 & s4 in on position



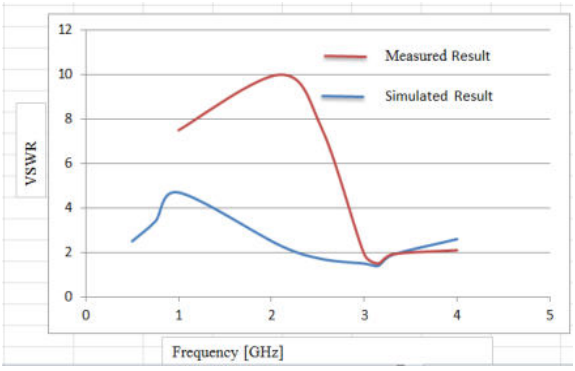
Sources: Authors Compilation

Figure-23: Comparative Return loss plot of RCMA with DGS & stubs with switch s1 in off and s2, s3 & s4 in on position



Sources: Authors Compilation

Figure-24: Comparative VSWR plot of RCMA with DGS & stubs with switch s1 in on and s2, s3 & s4 in off position



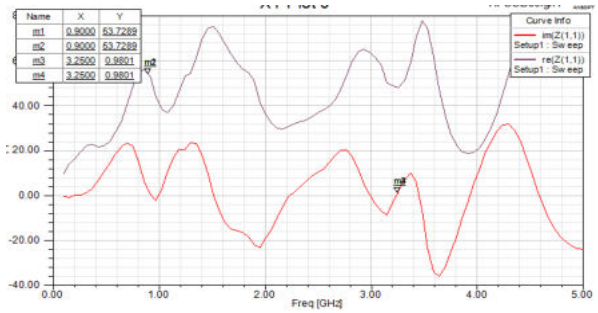
Sources: Authors Compilation

Table-2: Comparison of Simulated and Measured Results of RCMA with DGS & stubs

Sr. No.	Sw1	Sw2	Sw3	Sw4	Simulated B.W.	Measured B.W.
1.	OFF	OFF	OFF	OFF	2.97GHz 0.6-3.57GHz	3.2GHz 0.8-4GHz
2.	ON	OFF	OFF	ON	0.15 GHz 1.8-1.95GHz	0.5GHz 1.5-2.0GHz
3.	OFF	ON	ON	ON	1.15GHz 2.16-3.31GHz	0.3GHz 3.03-3.31GHz

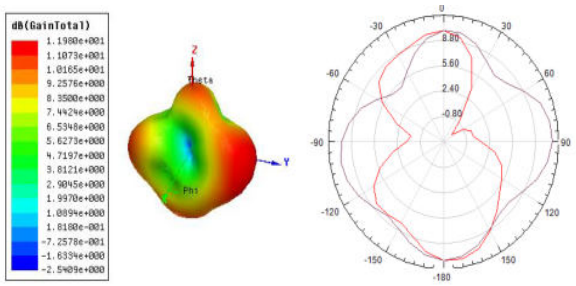
Sources: Authors Compilation

Figure-25: Impedance plot of RCMA with DGS & stubs with all switches in Off position



Sources: Authors Compilation

Figure-26: 2D & 3D Radiation pattern of RCMA with DGS & stubs with all switches in off position



Sources: Authors Compilation

Table-3: Comparison of Simulated Results

Antenna Performance Parameters	CMA	CMA with Reduced Patch	CMA with reduced patch using slit and dgs	CMA with reduced patch with slit, dgs , stubs and four switches in off position
Frequency Range	0.31GHz – 1.84GHz	0.53 GHz – 3.4GHz	0.32GHz – 3.57GHz	0.6GHz – 3.58GHz
BW	1.53GHz or 142.32%	2.87GHz or 146.05%	3.25GHz or 167.09%	2.98GHz or118.75%
VSWR	1.009 at 1.4GHz	1.25 at 1.4GHz	1.103 at 0.91GHz	1.09 at 0.91GHz
Return Loss	-58.28db at 1.4GHz	-26.88db at 1.4 GHz	-28.2db at 0.91GHz	-31.48db at 0.91GHz
Impedance	50.42Ω at 1.4 GHz	50.42Ω at 1.4 GHz	51.68Ω at 0.91GHz	53.72Ω at 0.91GHz
Gain (db)	6.8db at 1.4GHz	4.24 db at 1.4GHz	1.4e+001 db at 0.91GHz	1.19e+001db at 0.91

Sources: Authors Compilation

By connecting the stubs and keeping all switches in off position, the bandwidth is slightly reduced as compared to reduced CMA with slits, but this slight reduction in band width is unavoidable as the stubs are required for placing the switches to make the design reconfigurable, but the 2D & 3D Radiation pattern for this antenna has improved .This antenna can very well work as a sensing antenna for cognitive radio applications which is wide band and omni-directional. Thus, reduced circular monopole antenna has shown improved impedance bandwidth as compared to circular monopole antenna, which shows further improvement in bandwidth with the incorporation of DGS. It is also observed that resonant frequency shows a slight shift after incorporation of DGS (i.e.1.4GHz to 0.9GHz).

Reconfiguration of an Antenna

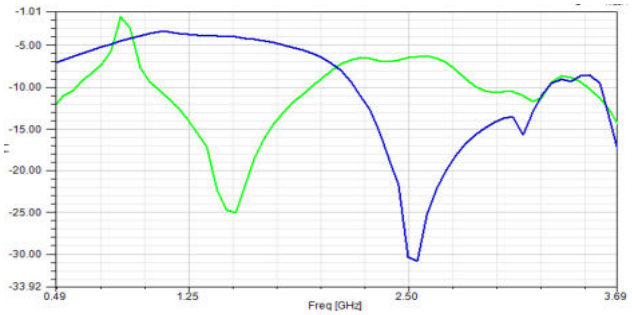
The geometry is further modified by addition of switches which makes and breaks the contact of stub with the micro strip line of an antenna. The reconfigurable antenna with four switches s1, s2, s3, s4 is shown in fig 22. By operating the switches in different (on/off) positions, the reconfiguration in operating frequency is achieved and the responses are studied and their combined response is shown fig 28. It clearly indicates that with change in on/off position of switches, the operating frequency range of antenna changes.

Table-4: Three Switchable Cases and Corresponding Frequency Bands

Case	Frequency bands (GHz)	SW1	SW2	SW3	SW4
1	0.6 to 3.57 GHz (uwb antenna)	off	off	off	off
2	1.8 to1.95 GHz	on	off	off	on
3	2.16 to 3.31 GHz	off	on	on	on

Sources: Authors Compilation

Figure-27: Reflection Coefficient [dB] versus Frequency [GHz]



Sources: Authors Compilation

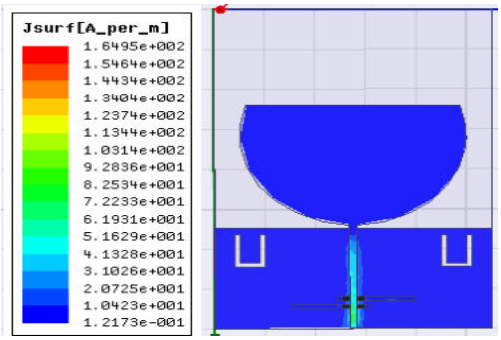
In fig.8, green colour indicates the return loss with switch s1 and s4 on and s2 s3 off. Bandwidth corresponding to this position ranges from1.08 to1.95 GHzi.e.0.87GHz.RL = -25db, VSWR=1.12, Gain= 5.19db, impedance = 45.13ohm at 1.5GHz.

Blue colour indicates the return loss plot with switch s1off and s2, s3, s4 on.Bandwidth corresponding to this position ranges from 2.16 to3.31GHz i.e.1.15GHz , RL=-31db,VSWR=1.05, Gain =6.7db, Impedance=49.53 ohm at 2.55GHz.

Analysis of an antenna using Current Distributions

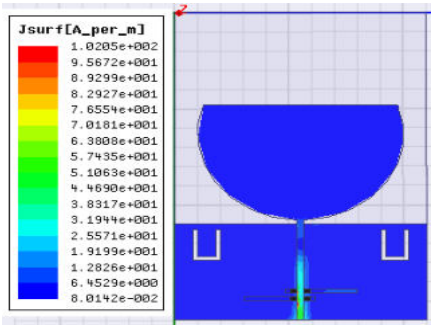
The simulated current distributions of circular monopole at different frequencies are presented in Fig-28 (a) through (f).

Figure-28a: Surface Current Distribution at 0.644GHz



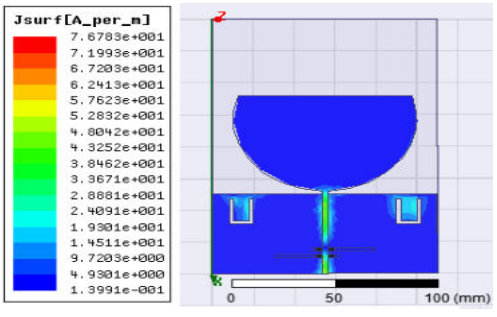
Sources: Authors Compilation

Figure-28b: Surface Current Distribution at 0.9GHz



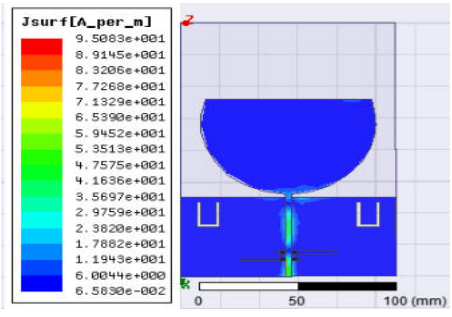
Sources: Authors Compilation

Figure-28c: Surface Current Distribution at 1.9GHz



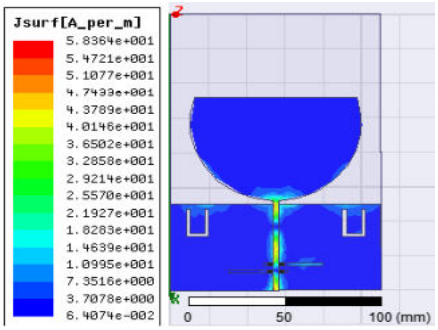
Sources: Authors Compilation

Figure-28d: Surface Current Distribution at 2.7GHz



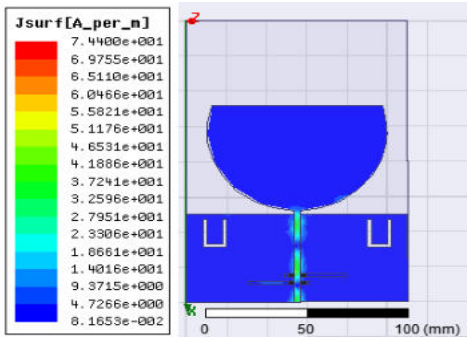
Sources: Authors Compilation

Figure-28e: Surface Current Distribution at 3.1GHz



Sources: Authors Compilation

Figure-28f: Surface Current Distribution at 3.53GHz



Sources: Authors Compilation

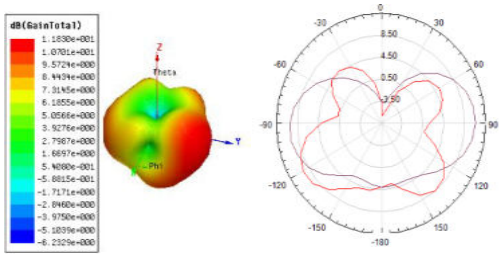
Fig. 28(a) through (f) shows the current pattern at different resonant frequencies. Fig.29 (a) shows the first resonance at 0.64 GHz. The current pattern near the third, fourth, fifth, sixth resonances are shown in Fig28 (c), (d), (e), (f) indicating approximately a second order harmonic. Fig (f) illustrates a more complicated current pattern at 3.53GHz, corresponding to the third order harmonic.

As shown in Fig 28, the current is mainly distributed along the edge of the feed-line for all of the six different frequencies. On the ground plane, the current is mainly distributed along the *y*-direction within a narrow area.Fig.28(c) only shows the current distribution along the DGS which clearly depicts that at the resonant frequency of 1.9 GHz the DGS helps in the process of radiation whereas at other frequencies there is no current distribution along the DGS indicating that there is no role of DGS in the process of radiation.

Analysis of an Antenna Using Radiation Pattern

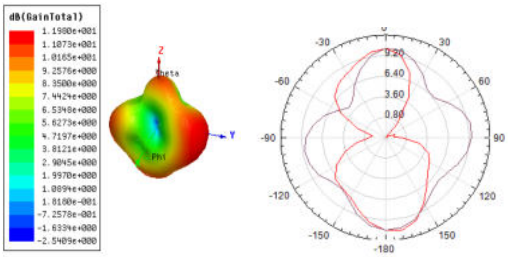
The simulated 2D & 3D Radiation patterns of circular monopole at different frequencies are presented in Fig 29.

Figure-29a: 2D and3D Radiation Pattern at 0.644GHz



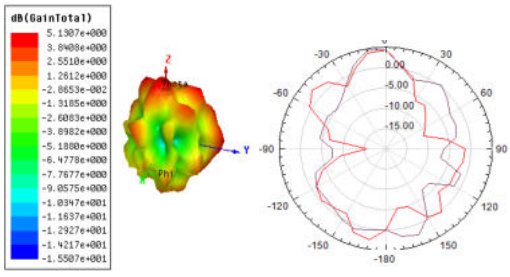
Sources: Authors Compilation

Figure-29b: 2D and3D Radiation Pattern at 0.9GHz



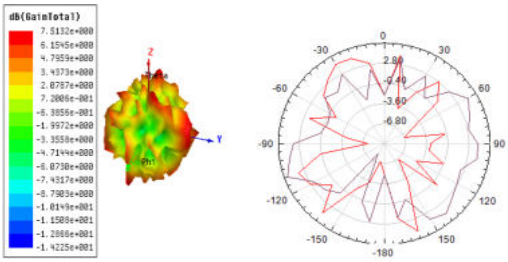
Sources: Authors Compilation

Figure-29c: 2D and3D Radiation Pattern at 1.9GHz



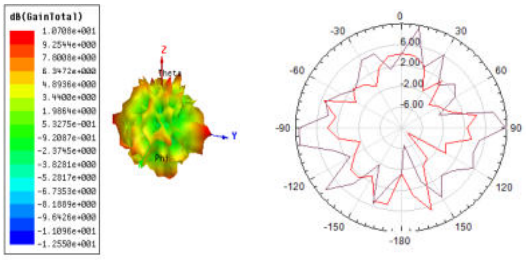
Sources: Authors Compilation

Figure-29d: 2D and3D Radiation Pattern at 2.7GHz



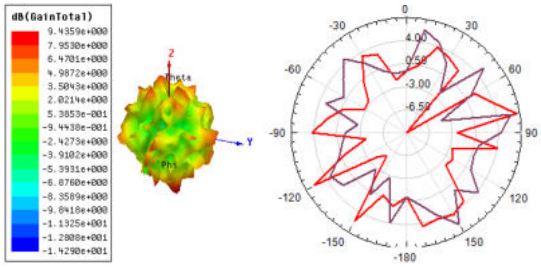
Sources: Authors Compilation

Figure-29e: 2D and3D radiation pattern at 3.1GHz



Sources: Authors Compilation

Figure-29f: 2D and3D radiation pattern at 3.53GHz



Sources: Authors Compilation

It is noticed that the patterns are almost omni-directional at lower resonances (1st harmonics) and become distorted at the higher harmonics. The transition of the radiation patterns from a simple doughnut shaped radiation pattern at the first resonance to the disturbed patterns at higher harmonics indicates that this antenna must have gone through some major changes in its behaviour.

CONCLUSION AND FUTURE SCOPE

The antenna is simulated using the simulation tool HFSS 13.0. The antenna can be used in a cognitive radio application for sensing as well as communicating purpose. The reconfigurable functions are obtained using four switches. By switching ON and OFF status of the four switches, antenna can work in different communicating & sensing modes. As a result, they can very well meet the requirements of cognitive radio antenna. In the future, we will investigate the real switches, such as PIN diodes or switch circuit networks.

REFERENCES

1. Yingsong Li, Wenxing Li, & Qiubo Ye. (2013). A Reconfigurable Triple-Notch-Band Antenna Integrated with Defected Microstrip Structure Band-Stop Filter for Ultra-Wideband Cognitive Radio Applications. ***Hindawi Publishing Corporation International Journal of Antennas and Propagation,*** 13Article ID 472645

2. Kapoor, Sakshi, & Parkash, Davinder. (2012, November). Miniaturized Triple Band Microstrip Patch Antenna with Defected Ground Structure for Wireless Communication Applications. ***Journal of Computer Applications (0975 – 8887),*** 57(7).

3. Sharma, M. M., Kumar, Ashok, Yadav, Sanjeev, & Ranga, Y. An Ultra-wideband Printed Monopole Antenna with Dual Band-Notched Characteristics Using DGS and SRR. ***In Proceedings of the 2nd International Conference on Communication, Computing & Security*** [ICCCS-2012].

4. Ghoname, R. S., Mohamed, M. A., & Hennawy, A. EL. (2012, September). Reconfigurable Compact Spider Microstrip Antenna with New Defected Ground Structure. ***International Journal of Computer Applications (0975 – 8887),*** 54(5).

5. Kumar, Sharma Pavan, Singh, Jadaun Veerendra. (August 2012). Multi-Band Rectangular Microstrip Patch Antenna with Defected Ground Structure and a Metallic Strip. ***International Journal of Technological Exploration and Learning (IJTEL),*** 1(1).

6. Chon, Chio Leong, Wai, Wa Choi, & Kam Weng Tam. (2009, October 20-23). ***A Tunable Monopole Antenna Using Double U-Shaped Defected Ground Structure with Islands.*** The 2009 International Symposium on Antennas and Propagation (ISAP 2009), Bangkok, Thailand.

7. Tawk, Y., Jayaweera, S. K., Christodoulou, C., & Costantine, G. J. (2011, December 7-9).***A Comparison between Different Cognitive Radio Antenna Systems.*** IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS).

8. Peshal, B., Verma, Nayak Sudhanshu, & Kumar, Preetam. (2012). Ultrawideband (UWB) Antenna Design for Cognitive Radio. IEEE. ***In Proceedings of 5th International Conference on Computer and Devices for Communication*** (CODEC.

9. Tawk, Youssef, Costantine, Joseph, Hemmady, Sameer, Balakrishnan, Ganesh, Avery, Keith, & Christodoulou, Christos G. (2012, February). ***Demonstration of a Cognitive Radio Front End Using an Optically Pumped Reconfigurable Antenna System (OPRAS).***IEEE Transactions on Antennas and Propagation, 60(2).

10. Khalil, H. Sayidmarie, & Fadhel, Yasser A. (2012, November 12-13). Design Aspects of UWB Printed Elliptical Monopole Antenna with Impedance Matching. ***In Loughborough Antennas & Propagation Conference,*** UK: Loughborough.

11. Al-Husseini, Mohammed Ali Ramadan, Youssef Tawky, Christos Christodoulouy, Karim Kabalan, Ali El-Hajj. A Planar Ultrawideband Antenna with Multiple Controllable Band Notches for UWB Cognitive Radio Applications. ***In Proceedings of the 5th European Conference on Antennas and Propagation*** (EUCAP).

12. Tawk, Y., S. Hemmady, C. G, Christodoulou, J. Costantine, Balakrishnan, G. (2011). ***A Cognitive Radio Antenna Design Based on Optically Pumped Reconfigurable Antenna System (OPRAS)***. IEEE.

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SECURE ELECTRONIC TRANSACTIONS: A STUDY OF AUTHENTICATION MEASURES ADOPTED BY INDIAN BANKS

Tejinder Pal Singh Brar[21] Dr. Sawtantar Singh Khurmi[22] Dr. Dhiraj Sharma[23]

ABSTRACT

With the introduction of enhanced communication technologies, Indian banks have witnessed rapid growth not only in their customer base but also in revenue generated by them. However, customers on the other hand are more and more apprehensive about various security threats and they feel the need of increased security especially due to the sensitive nature of the information exchanged. As attacks against E-banking authentication mechanisms have evolved in a quicker manner, this scenario affects the customers' trust in negative manner thus affecting the spread of E-banking applications in the market. This paper studies and evaluates authentication mechanisms that are adopted by Indian banks. The study will be helpful for security consultants, auditors or security officers who are interested in conducting security analysis.

KEYWORDS

Phishing, Authentication, OTP, Malware etc.

INTRODUCTION

With the introduction of enhanced communication technologies number of electronic services for both corporate and retail customers' have evolved and spread widely. On the other hand, the need for security has also increased because attackers have developed more complicated methods to compromise authentication mechanisms and gain unauthorized access to customers' sensitive information. Because of this, not only user's trust has been decreased but also the spread of Internet banking applications in the market. Now a day's data breaches are happening all over the world on a regular basis. Phishing attacks or malware can easily steal passwords, and attacker correctly answers the challenge questions based on amount of information about customer that is available online. Many data breaches are linked to compromised usernames, passwords and OTP's. It raises a question: Why do not we make strong security controls and why we rely on simple user names and passwords? Infect, no single security solution is enough to defend against today's versatile attacks. Various attack tools have been developed and programmed into downloadable kits. Rootkit-based malware secretly installed on a computer system that can monitor a customer's activities that aid theft and misuse of their login credentials. Such type of malware can break strong authentication techniques like multi-factor authentication.

In the current online banking scenario, the last development that was found to be made by financial institutions is multi-factor authentication in which user need to prove his identity more than one way. The general way that we think about this is depends upon two factors i.e. "something user knows" and "something user have". Customer is required to enter username and password as the first factor and then afterwards OTP is sent to customer's mobile phone through which customer conduct transactions. E-banking systems create the requirement for specialized knowledge on security issues to be able to effectively conduct an auditing or security evaluation process. The information systems (IS) auditor more specifically should have the necessary skills (technical and operational), knowledge to carry out the review of the technology employed, and risks associated with e-channels.

This article reviews possible attacks according to which authentication mechanisms adopted by banks evaluated. An attack tree is created to propose a guide that an auditor, a security consultant or a security officer may use for conducting a security analysis. A case study presents a security analysis of an Internet banking authentication mechanism conducted for a major bank, describing how the attack tree may be deployed.

REVIEW OF LITERATURE

Security and data confidentiality are major barriers in E-Commerce applications for the banking industry. Customers who wish to trade in the E-commerce world found security and privacy is the most challenging problems faced by them. Security further affects trust and satisfaction of the customer. There are number of factors, which affect the customers thinking about online banking security. The same factors are also driving the need for enhanced authentication for online banking solutions. These factors include the growing number of phishing attacks, increased usage of pharming and malware and widespread data security breaches. Malhotra and Singh (2009) found that slowly but steadily, the Indian customer is moving towards internet banking. However, they are concerned about issues such as security and privacy. Mukti (2000) found that security is main barrier to e-commerce expansion in Malaysia. According to him, security is the most feared problem on the internet. Banks and customers

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take a very high risk by dealing electronically. The survey conducted by White and Nteli (2004) found that UK consumers ranked the security of bank's website as the most important attribute of internet banking service quality.

Sathye (1999) further illustrates this situation, investigate the adoption of internet banking found that security concerns and lack of awareness about the internet banking were the two main obstacles for the non-adoption. Fitzergerald (2004) argued that lack of awareness of online banking and the security concerns are the major 'non-adoption' areas of E-banking. Kalakota and Whinston, (1997) defines Perceived security as a threat that creates a circumstance or condition, with the potential to cause economic hardship to data or network resources in the form of destruction, disclosures, and modification of data, denial of service, and/or fraud, waste and abuse. According to Aladwani (2001), future challenges for the adoption of E-banking are internet security, consumers' privacy, bank's reputation and online banking regulations. Author further found that customers ranked privacy and internet security as the most important future challenges.

According to the white paper published by Symantec co. malicious applications that steal financial account information have increased dramatically over the last few years, resulting in a direct loss of hard currency as well as loss of trust. Dixit and Dutta (2010) insist that banks needs to increase the level of trust between banks' website and customers. According to Alnsour and Hyari (2011) trust has a significant and positive effect on ease of use. The more a user trusted the bank and its website, the higher their belief that online banking is easy. Higher levels of security may make online banking more useful.

Bala et al. (2011); Viega and McGraw (2001) suggests developers have to incorporate security during the development process itself in order to produce software assurance systems, since the existence of flaws at the design or coding stage of the development process can open web applications to a wide range of attacks. According to Lin and Vardharajan (2006), trust is the expectation that a device or system will faithfully behave in a particular manner to fulfill its intended purpose, e.g., a computer is trustworthy if its software and hardware can be depended on to perform as expected such that its services are still available today, unaltered, and behave in exactly the same way as they did previously.

Similarly, Krauter and Faullant (2008) confirmed the influence of trust on risk perception and consumer attitudes towards internet banking. Tendency to trust is a determinant not only for interpersonal relationships but also for trust in technological systems. On the same lines Tat et al. (2008) study predictors of intention among users to continue using the E-banking services in Malaysia and conclusion confirmed that among the tested predictors, trust is found to be the strongest predictor of intention to continue using internet banking, followed by compatibility and ease of use.

Detection of attacks still needs to be enhanced significantly not only in India but also across the globe. The online fraud/attacks that have been reported around the globe over the last 2 years are related to poor or simplistic authentication practices. In spite of innovation in security technologies, fraudsters still manage to breach banks' resistance from time to time. Consider these numbers: every month, around 18,000 phishing attacks take place around the world; 3% of Internet users from the EU27 group of countries lost money to online fraud last year; and there are at least 2,500 varieties of E-banking malware. Nearly 80% of U.S. banks think that malware on their customers' PC is a top security risk. Indeed this seems justified because U.S. consumers lost over US$ 2 billion and 1.3 million PCs to malware in 2010, Dinesh (2011). The top spot of weak authentication is taken by password, which is the most prevalent, and weak form of authentication because it is very easy to steal. According to Kitten (2014), the average annualized cost of cyber-crime for U.S., financial services institutions in 2013 was $23.6 million i.e. nearly 44 percent increase from 2012. Almost all of these major fraud cases in the last couple of years can be linked to authentication infrastructures.

Schwartz (2014) describes a security lapse related to credit and debit card transactions; he described how Atlanta-based world's largest express carrier and package delivery company UPS store suffered a point-of-sale malware attack that compromised numerous card transactions. About 105,000 credit card and debit card transactions were compromised in this data breach. On the same lines Karimi (2014) reports that Federal Trade Commission reports identity theft accounted for 18 percent of consumer complaints in 2012 alone and about 85 percent of identity theft incidents involved fraudulent use of credit card information. Finkle and Henry (2013) found that Target Corp (TGT.N) which is one of the biggest retailers in U.S. attacked by hackers in November 2013 which lasts for 19 days. This attack compromised up to 40 million credit cards and debit cards also managed to steal encrypted personal identification numbers (PINs) that makes it the second-largest data breach in U.S. retail history.

While analyzing Indian scenario of cyber-attacks, Bipindra (2014) in his report highlight the incident when Defense Research and Development Organization's (DRDO) computers were hacked by Chinese hackers and carted away electronic files relating to Cabinet Committee on Security (CCS) which is the country's highest decision-making body on security affairs. This is not the first incident where China has been concerned in security attacks on the Indian government. According to article posted by Information Age (2012), hackers have breached information systems belonging to the Indian Navy, stealing sensitive data and sending it to computers with Chinese IP addresses. It was found that systems at India's Eastern Naval Command were found to be infected with malware in February 2012. The malware collected and transmitted confidential files and documents to Chinese IP addresses. Similarly, a report from the University of Toronto in 2010 alleged that Chinese hackers had accessed Indian military systems.

Kumar (2014), states that 3,000 internet connections of the Defense Ministry and the Air Force Communication Centre have been compromised and about three hundred thousand modems in Delhi are also vulnerable to Domain Name System (DNS) exploitation attacks, with servers based in foreign countries that can access sensitive information by means of phishing, traffic interception and diversion through a specific route. While taking note on state-wise scenario, NCRB (2013) reported 4,356 cases were registered under IT Act during the year 2013 as compared to 2,876 cases during 2012, thus showing an increase of 51.5% in 2013 over 2012. Similarly, according to Gurung (2014) there is an increase in the cybercrime by 51%, the cases related to cybercrime that was filled in the year 2013 was 4356 and this year it is increased by 51 percent in comparison to previous year.

The increase in the cybercrime has mainly linked three states that are connected to Information Technology (IT) i.e. Andhra Pradesh, Karnataka and Maharashtra. Table-1 shows incidences of registered cases in top 10 states of India during 2013 and their comparison with cases registered in 2012.

In yet another kind of security, related incident Tripathy (2014) reported that Chinese telecom company Huawei Technologies had hacked into telecom carrier Bharat Sanchar Nigam Ltd (BSNL). Similarly, in 2012, a US panel urged American companies to stop doing business with Huawei and ZTE Corporation and warns that China could use firms' equipment to spy on certain communications and threaten vital systems through computerized links. A report from NCRB (2013) as shown in table-1 shows year wise comparison from 2010 to 2013 of various IT related crimes.

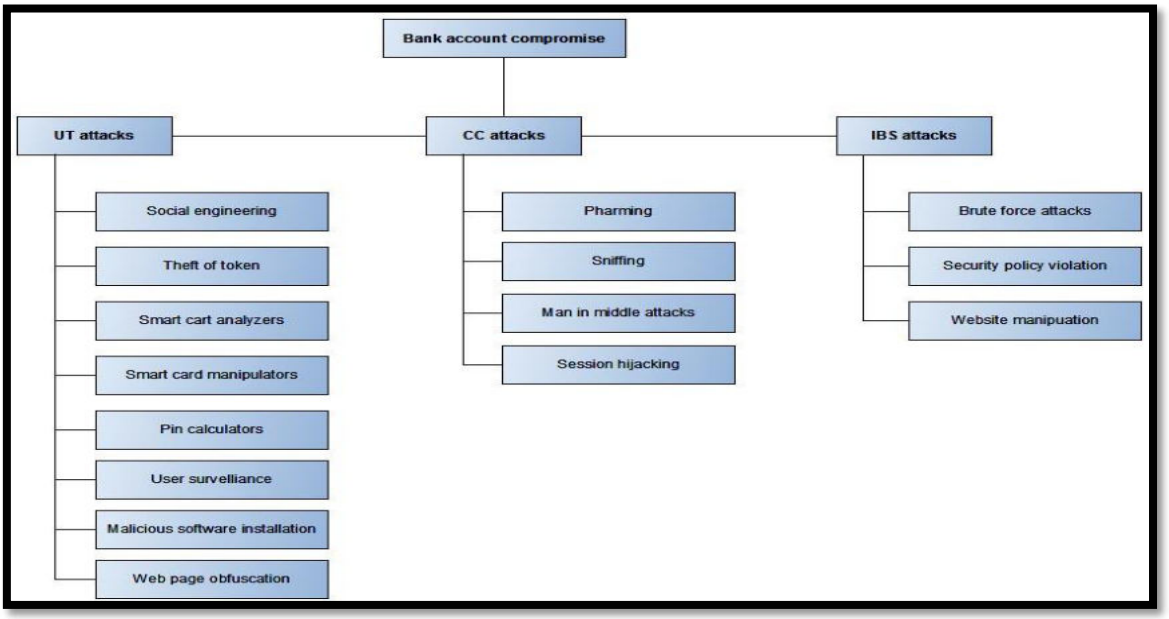
Table-1: Year wise Comparison of Different Crime Heads in India

S. No.	Crime Heads	Cases Registered				% Variationin 2013 over 2012
		2010	2011	2012	2013	
1.	Tampering documents	64	94	161	137	-14.9
2.	Hacking i) Damage/loss to computer resource ii) Hacking	 346 164	 826 157	 1440 435	 1966 550	 36.5 26.4
3.	Failure of compliance of certifying authority	2	6	6	13	116.7
4.	To assist in decrypting the information intercepted by government agency	1	3	3	6	100.0
5.	Unauthorized access to protected computer system	3	5	3	27	800.0
6.	Publishing false digital signature certificate	2	3	1	4	300.0
7.	Breach of confidentiality/privacy	15	26	46	93	102.2
8.	Fraud of digital signature certificate	3	12	10	71	610.0

Sources: NCRB (2013)

ATTACK TREE

Figure-1



Sources: Authors Compilation

There is one node at the root level i.e. user's bank account compromise that represents the final target of the attacker. An attacker may use one of the leaf nodes as a means for reaching the target. Internet banking attacks can be classified into three categories:

- User terminal (UT) attacks,
- Communication channel (CC) attacks,
- Internet banking server (IBS) attacks.

User Terminal (UT) Attacks: These attacks primarily target the user equipment like the tokens that may be involved, such as smartcards or other password generators, as well as the actions of the user himself. These attacks include:

- **User Surveillance**: It is analogous to the personal identification number (PIN) thefts facilitated by the installation of cameras in automatic teller machines (ATMs); the user's actions may be monitored to capture credentials.

- **Theft of Token and Handwritten Note Stealing**: Despite the security guidance provided by their banks, users may keep their Internet banking usernames and passwords in written form. These notes may be stolen, providing access to the user's credentials. On the other hand, tokens may also be stolen that help the attacker with one authentication factor that, when combined with other types of attacks (such as PIN calculators) can lead to identity theft.

- **Malicious Software Installation:** The embedding of malicious content for compromising the user's login information and password (e.g., keyloggers or screen capture) may take place through number of different methods like hidden code and worms/bots. Hidden code is used within a web page that exploits a known vulnerability of the customer's web browser and installs malicious software in the user terminal. Whereas worms search vulnerabilities and exploit them automatically like exploit of instant messaging and chatting communication software (that allows the embedment of dynamic content), which may automatically be deployed using bots.

- **Smartcard Reader Manipulator**: This is relevant to noncertified smartcard readers with the interfaces that are insecure and may expose the contents of the smartcard by conducting unauthorized operations.

- **Social Engineering:** The focus of these attacks is on compromising the user's credentials by various means like phone calls or the submission of e-mails masquerading as an official bank, asking the user for username and password.

- **PIN Calculators:** These attacks break the security of tokens that generate PINs in random manner.

- **Smartcard Analyzers:** Attacks against smartcards may expose the security of the smartcard by revealing cryptographic keys and passwords. Such attacks are sophisticated and not easy to implement, but are very efficient if the manufacturer of smartcards does not implement the necessary countermeasures against these types of attacks.

- **Web Page Obfuscation:** These attacks are used to confuse the user and are based on links that do not correspond to the destination they describe, or the use of IP addresses instead of URL. Other techniques install hidden frames, which are used for hiding the real activity of a web page by using several frames with malicious content.

Communication Channel (CC) Attacks: These attacks focus on communication links. These attacks include:

- **Pharming**: A cyber-attack is anticipated to redirect a bank's website traffic to another, fake site. It involves compromising and altering DNS and its tables. It connects the user to fraudulent sites, instead of the official bank's site, where information regarding the user's account may be derived. Compromised DNS servers are sometimes referred to as "poisoned".

- **Sniffing**: It refers to listening to a conversation. Active sniffing attacks impersonate the two communicating parties to each other (i.e. client and E-banking server) to capture information such as username and password. Passive sniffing accumulates information from the communication medium, without interception.

- **Active man-in-the-middle Attacks**: In this type of attack the attacker receives and forwards information between the user terminal and E-banking server. The attacker sends distorted user packets or injects new traffic like transfer commands from one account to another.

- **Session Hijacking**: Session hijacking is also known as cookie hijacking, is the exploitation of a valid computer session to gain unauthorized access to information or services in a computer system. A popular method is using source-routed IP packets.

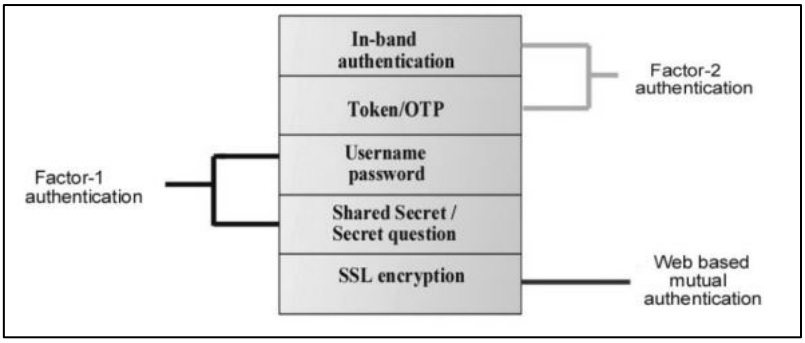
Internet Banking Server (IBS) Attacks: These types of attacks are offline attacks against the servers that host the Internet banking application. Examples include:

- **Brute-force Attacks:** Brute-force attack is a type of attack that can be used against any encrypted data. This type of attack might be used when it is not possible to take advantage of other weaknesses in an encryption system. It is based on distributed zombie personal computers, hosting automated programs for username or password based calculation.
- **Bank Security Policy Violation:** Violating the bank's security policy by combining weak access control and logging mechanisms such as an employee may cause an internal security incident and expose a customer's account.
- **Web Site Manipulation**: Altering the contents of E-banking login page by exploiting the vulnerabilities of the E-banking web server. This may readdress the user to a fraudulent web site where his credentials may be captured.

AUTHENTICATION MEASURES PROVIDED BY INDIAN BANKS

In order to prevent online banking fraud, authentication of both customers and transactions is vital. Let us look at the current state of online banking authentication techniques used by various bank groups in India. At present, authentication of corporate customers' is performed by using combination of the methods (refer figure2).

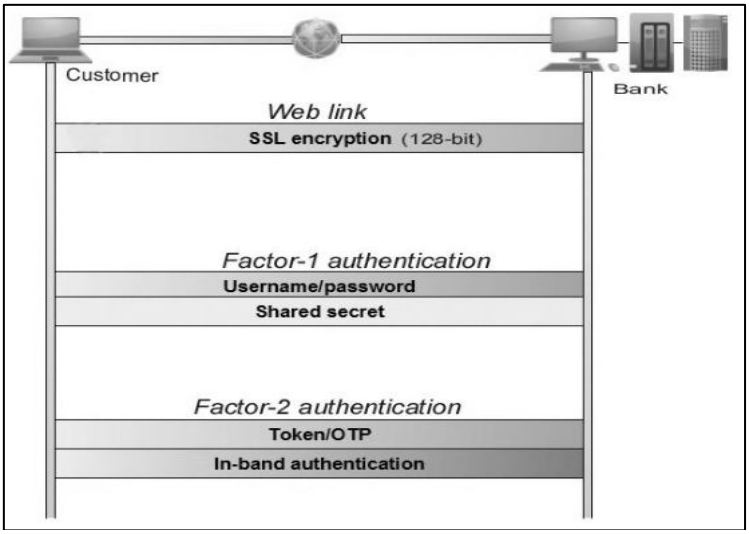
Figure-2: Different Security Layers in Current E-Banking Environment



Sources: Authors Compilation

Secured link between customer and bank branch is provided by 128-bit SSL encryption (refer figure 3). Further factor-1 authentication is provided by user id/username password and shared secret / secret question. In factor-2 authentication, another layer of security is provided by OTP/Token that uses in-band authentication.

Figure-3: Different Factors of Security between Customer and Bank



Sources: Authors Compilation

SECURITY ANALYSIS

The attack tree provides a comprehensive view on the different types of attacks, the analysis of which should make possible the process of studying the competence of existing counter measures used by banks in India. This study focuses on the various authentication mechanisms and studies their strength against the attack tree. Table 2presents the applicability of attacks in different authentication mechanisms.

Table-2: Applicability of Attacks in Diverse Authentication Mechanisms

	One Time Password	Username/ Password	SSL Encryption	Secret Question
USER TERMINAL ATTACKS				
Social engineering	N.A	A	N.A	N.A
Theft of tokens	A	A	N.A	N.A
Smart card analyzers	A	N.A	N.A	N.A
Smart card manipulators	N.A	N.A	N.A	N.A
Pin calculators	A	N.A	N.A	N.A
User surveillance	A	A	N.A	N.A
Malicious Software installation	A	A	A	N.A
COMMUNICATION CHANNEL ATTACKS				
Pharming	A	A	N.A	A
Sniffing	A	A	N.A	A
Man in middle	A	A	N.A	A
Session hijacking	A	A	N.A	A
INTERNET BANKINGSERVER ATTACKS				
Brute force attacks	A	A	N.A	N.A
Security policy violation	A	A	A	A
Website manipulation	A	A	N.A	N.A

Sources: Authors Compilation
Note: A: Applicable, N.A: Not Applicable

Username / Password

Combination of username and password is the most common authentication mechanism, which is based on proof by knowledge. It is widely utilized in E-banking applications. The authentication process is usually password-oriented even in case of custom non-web-based Internet banking software. This mechanism is prone to different types of attacks like capture, replay, guessing or phishing are common and effective attacks. It excludes those attacks that are customized to smartcards, which are not applicable and IBS, which is considered as an internal attack. The standard approach that banks follows is password authentication takes place through a SSL channel after authenticating from IBS. Static passwords may be captured when attacking the secure channel establishment process (e.g., by deploying sniffing attacks). The splitting may be performed in one-way SSL authentication by sending fraudulent certificates to the user, who usually does not check the true source and legality.

Soft-token Certificate/SSL

It is a standard security protocol/technology for establishing an encrypted links between a server and a client—typically a mail server and a mail client or a web server and a browser. This technology allows customer's sensitive information such as credit card numbers, SSN's, and login credentials to be transmitted securely. Data sent between web servers and browsers is sent in plain text that left customer susceptible to eavesdropping. If incase an attacker is able to capture all data being sent between a browser and a web server they can use that information. This mechanism is prone to different attacks that compromise the user terminal. User terminal may permit access to the user certificate, which results in identity theft.

One-time Password/Time-based Code Generator

OTP or one-time password/passcode can come from token, SMS or any other source. It falls in the category of proof by possession authentication mechanisms. A random calculator, using a seed that is pre-shared between the user's terminal and the IBS, generates them. The user reads the SMS and provides the OTP to the banking application for authentication. These mechanisms exposed to a number of attacks like regular theft attacks, combined with user surveillance or notes theft for obtaining the PIN. Attacks that are more sophisticated are deployed exploiting the PIN time window. This fact also makes brute-force attacks possible because the likelihood of guessing possibilities is increased. Hardware attacks are also possible by deploying the hardware analysis methods presented in the attack tree description.

Secret Question

Depending on the content of the questions, this mechanism is considered as behavioral authentication or a more sophisticated combined password mechanism. It consists of a number of questions that the user has to answer to gain access to the account. Although this mechanism is resistant to number of user terminal attacks but it is prone to most of the remainder attack types, since malicious code may copy answers and create a knowledge database for the user. The user may also answer questions from an attacker, due to being tricked by phishing, man-in-the-middle attacks or malformed IBS web sites. Brute-force attacks are difficult to deploy due to the multitude of possible answers.

COUNTERMEASURES

The security assessment need to be implemented to assess the security level of authentication mechanism, while considering all entities involved in the process and propose the necessary countermeasures for risk reduction. E-banking authentication mechanism needs to be based on three different methods depending on his particular needs i.e. password-based authentication, PIN calculators and software-based certificates.

- The first step is to collect information about the system like system's manuals, implementation reports, on-spot visits and interviews with personnel. System information included system design, implementation details and history of security events, configuration files and existing audit reports.

- The second step is to deploy the attack tree for identifying vulnerabilities and deciding on the applicability of attacks. For this purpose, the information gathered from the first step was analyzed.

- The third step was to identify the appropriate countermeasures from table-3and create a blueprint of combined countermeasures to enhance the system's security level. The report, including vulnerabilities, possible attacks and countermeasures, was delivered to the bank's security officer, and an executive summary was presented to the bank's management for decision-making.

Table-3: Type of Attacks and Countermeasures

Type of attack		**Countermeasure**
UT attacks		
	Social engineering	Security awareness Anti-phishing software (URL inspection)
	User surveillance/ Theft of token	Do not write down passwords. Do not enter passwords with other people watching. Do not share passwords.
	Smartcard analyzers/manipulators	Power- and time-neutral code design Secure smartcard interface design and implementation
	PIN calculators	Increased number of digits—at least an eight-digit code18
	Web-page Obfuscation	Use of a predetermined list of valid URLs Prohibiting the use of IP addresses instead of URLs DNS monitoring
	Malicious software installation	Operating system/browser patching Code installation blockers Antispyware software, Firewall for blocking inbound and outbound connections to unauthorized ports Intrusion/anomaly detection
CC Attacks		
	Pharming	DNS security countermeasures: prevention, detection, reaction countermeasures (e.g., depending on the implementation, appropriate firewall, intrusion detection and prevention, patch management)
	Sniffing	Mutual authentication and encryption through client-server SSL/use of predetermined SSL certificates
	Man in middle	Mutual authentication and encryption through client-server SSL/use of predetermined SSL certificates
	Session hijacking	State management to prevent session ID specification in the message, session ID rotation and life cycle management
IBS attacks		
	Brute-force attacks	Prevention, detection and reaction countermeasures (firewall, intrusion detection and prevention) to detect and block attacks
	Bank security policy violation	Security policy implementation according to ISO 17799
	Web site manipulation	Standard prevention, detection and reaction countermeasures (e.g., depending on the implementation, appropriate firewall, intrusion detection and prevention, patch management, web server security best practices depends on the web server deployed)

Sources: Authors Compilation

CONCLUSION

Any activity that carries with it risk on customer's system is a candidate for strong authentication. The interesting concept emerging from this E-banking scenario is the need for enhanced security. Strong authentication is required at different levels of conducting transaction via electronic means. First, strong authentication is critical at customer login. Secondly, protecting actual transactions is critical, and it is vital to include transaction details to protect against malware that modifies transactions. Third, it is important to start looking into other account related activities like view account details, bill payment or creating and managing administrative users in the corporate firm. Banks need to realign their authentication infrastructures to include a mix of multi factor authentication measures.

It is important to not only to evaluate online banking applications and identify existing vulnerabilities but also there is a need to evaluate layered security approaches and the areas where these additional layers of authentication should be added. For online, as well as other financial transactions, strong authentication measures should be built into the multifactor approach.

RECOMMENDATIONS

Financial institutions in India show upward trend in terms of adoption and usage of electronic banking by retail and corporate sector. However, due to fear of financial loss customers' are losing their trust on E-banking security mechanisms. However, banks are trying their best to provide secure environment in which customers' can transact with confidence. As the study evaluates, due to ongoing cyber-attacks and vulnerabilities in current security measures, there is a need to further strengthen the level of security.

Banks should perform periodic risk assessments prior to implementing new electronic financial services or at least every twelve months and adjust their authentication controls for corporate customers' in reply to new threats to their online accounts. Customers' should also periodically assess their risks and controls regarding online banking access and user authority like monitoring accounts frequently and reviewing electronic transfers and other online activity; implementing approval for online activity; securing all IDs and passwords and ensuring authorized employees are not sharing their online credentials and finally educating employees.

Even after providing layered security to customer's account, still in case if online banking access has been locked or a suspicious transaction has been identified then additional verification may be performed. In these cases, "enhanced device identification" method can be used to strengthen the identity confirming process. Bank may need to perform additional verification procedures by using callback (voice) verification or electronic mail approval. Banking institutions need to develop "day-to-day situational awareness" of the latest threats.

Situational awareness requires understanding threats and risks in real time to help minimize the impact. To gain this kind of understanding, financial institutions have to detect attacks as they happen and that requires a strong emphasis on cyber-intelligence. Banks need to have dedicated threat-management teams that are at the frontlines as well as automation and analytics.

REFERENCES

1. Aladwani, M. (2001). Online banking: A field study of drivers, development challenges, and expectations. ***International Journal of Information Management***, 213-225.

2. Alnsour, M., & AL-hyari, K. (2011). Internet banking and jordanian corporate customers: issues of security and trust. ***Journal of Internet Banking and Commerce***, 16(1). Retrieved on November, 2012 from http://www.arraydev.com/commerce/jibc

3. Bala, M. S., & Norita, M. N. (2011). Secure E-commerce web development framework. ***Information Technology Journal,*** 10(4), 769–779.

4. Bipindra, N. C. (2013). ***Chinese 'hack' DRDO computers***. Retrieved on July, 2014 fromhttp://www.newindianexpress.com/nation/article1500336.ece,

5. Dinesh, T. C. (2011). ***What the future of online banking authentication could be***. Retrieved on July, 2014 from www.infosys.com/finacle

6. Dixit, N., & Datta, S. K. (2010, August). Acceptance of E-banking among adult customers: an empirical investigation in India. Journal of internet Banking and Commerce, 15(2). Retrieved on November, 2012 from http://www.arraydev.com/commerce/jibc,

7. Finkle, J., & Henry D. (2013). ***Target hackers stole encrypted bank PINs.*** Retrieved on August, 2014 from http://www.reuters.com/article/2013/12/24/us-target-databreach-idUSBRE9BN0L220131224,

8. Fitzergelad, K. (2004). ***An Investigation into people's perceptions of online banking*****.** Retrieved on March 2011 from http://staffweb.itsligo.ie/staff/eward/ebus%200203/Discussion%20topics/Online%20Banking.ht.

9. Gurung, V. (2014). ***Latest Cyber Crime Reports of India***. Retrieved on July, 2014 from http://www.cyberkendra.com/2014/07/latest-cyber-crime-reports-ofindia.html#.UaF_8WSySo.

10. (2012). ***Information age, Chinese hackers access Indian navy systems.*** Retrieved on June, 2014 from http://www.information-age.com/technology/security/2110843/%22chinese%22-hackers-access-indian-navy-systems.

11. Kalakota, R., & Whinston, A. B. (1997). ***Electronic commerce: A manager guide.*** Addoson Wesley, Reading, MA.

12. Karimi, S. (2014). ***6 Things You Must Do After Hackers Steal Your Credit Card Data***. Retrieved on August 2014 from http://money.usnews.com/money/blogs/my-money/2014/02/19/6-things-you-must-do-after-hackers-steal-your-credit-card-data.

13. Kitten. (2014).***How to Improve Threat Detection.*** Retrieved on August 2014 from http://www.bankinfosecurity.com/interviews/banks-how-to-improve-threat-detection-i-2328.

14. Krauter, S. G., & Faullant, R. (2008). Consumer acceptance of internet banking: The influence of internet trust. ***International Journal of Bank Marketing****,* 26(7), 483-504. Emerald Group Publishing Limited

15. Kumar, V. (2014).***Cyber snoops hack India's secrets: Report reveals how internet spies may have 'compromised' the nation's security.*** Retrieved on June, 2014 from http://www.dailymail.co.uk/indiahome/indianews/article-2586442/Cyber-snoops-hack-Indias-secrets-Report-reveals-internet-spies-compromised-nations-security.html#ixzz3B5sPlTfV

16. Lin, C., & Varadharajan, V. (2006). Trust enhanced security—a new philosophy for secure collaboration of mobile agents. In: ***Collaborative computing: networking, applications and work-sharing (CollaborateCom'06)*****,** Atlanta, 1-8.

17. Malhotra, P., & Singh, B. (2009). Analysis of internet banking offerings and its determinants in India. ***Internet Research***, 20 (1), 87-106.

18. Mukti, N. (2000). Barriers to putting businesses on the internet in Malaysia. ***The Electronic Journal of Information Systems in Developing Countries*****,** 2(6), 1–6.

19. (2013). ***Cybercrimes*** (NCRB). Retrieved on May, 2014 from http://ncrb.gov.in/CD-CII2013/Home.asp.

20. Sathye, M. (1999). Adoption of internet banking by Australian consumer: An empirical investigation. ***International Journal of Bank*****.** 17 (7), 324-334.

21. Schwartz, M. J. (2014). ***UPS Reveals Data Breach***. Retrieved on August, 2014 from www.bankinfosecurity.com/ups-reveals-data-breach-a-7217.

22. Tat, H. H., Nor, K. M., Yang, T. E., Hney, K. J., Ming, L. Y., & Yong, T. L. (2008). Predictors of the intention to continue using internet-banking services: An empirical study of Current users. ***International Journal of Business Information*****,** 3(2).

23. Tripathy, D. (2014). ***India-probes-media-report-of-Huawei-hacking-BSNL.*** Retrieved on July, 2014 from http://www.livemint.com/Industry/rAWayE115erqLzGZOXxVDO/India-probes-media-report-of-Huawei-hacking-BSNL.html

24. Viega, J., & McGraw, G. (2001) ***Building secure software*****.** Addison-Wesley, Boston.

25. White, H., & Nteli, F. (2004). Internet banking in the UK: why are there not more customers? ***Journal of Financial Services Marketing***, 9 (1), 49-56.

26. Retrieved from http://ncrb.gov.in/CD-CII2013/Chapters/18-Cyber%20Crimes.pdf

27. Retrieved from http://writepass.com/journal/2012/12/bio-metric-technologies-are-capable-of-providing-the-secured-wa...

28. Retrieved from http://www.ijmbs.com/Vol4.4/spl1/1-Tejinder-Pal-Singh-Brar.pdf

29. Retrieved from http://www.ijsrp.org/research-paper-0514/ijsrp-p2986.pdf

30. Retrieved from http://www.infosys.com/finacle/solutions/thought-papers/Documents/what-the-future-online-banking.pdf

31. Retrieved from http://www.isaca.org/Journal/Past-Issues/2007/Volume-3/Documents/jpdf0703-analyzing-the-security.pdf

32. Retrieved from http://www.isaca.org/Journal/Past-Issues/2007/Volume-3/Pages/Analyzing-the-Security-of-Internet-Bank...

33. Retrieved from http://www.newindianexpress.com/nation/article1500336.ece?service=print

34. Retrieved from http://www.studymode.com/essays/Future-Of-Online-Banking-1845204.html

35. Retrieved from http://www.symantec.com/avcenter/reference/phishing.in.the.middle.of.the.stream.pdf

36. Retrieved from https://www.ischool.utexas.edu/~jforbes/ecom/security.htm

37. Retrieved from https://www.virusbtn.com/virusbulletin/archive/2005/07/vb200507

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PLASTIC MONEY: TREND, ISSUES AND CHALLENGES

Rajesh Tiwari[24] Priyanka Kumari[25]

ABSTRACT

The paper evaluates the issues and challenges of plastic money usage in India. The entry of private players and adoption of information technology have brought transformation in the way financial transactions are being done. Plastic money has emerged as a cost effective and convenient way to make financial transactions. The private banks are leaders in credit cards issue while public sector banks lead in debit cards. The penetration of cards is low. The conservative consumers prefer debit cards over credit cards. The IT savvy government brings lot of hopes of improving financial inclusion by leveraging technology. The cases of card frauds by cloning are issues, which require urgent attention of industry and regulator. The paper concludes by evaluating the advantages and challenges of plastic money.

KEYWORDS

Plastic Money, Information Technology, Credit Cards, Debit Cards, Cloning etc.

INTRODUCTION

The information technology has been instrumental in transforming the manner and ways of doing financial transactions. The plastic money has added convenience to consumers lowered operational cost of banks and expanded the customer base of banks.

Plastic Money

Plastic money is referred to the credit cards or the debit cards that we use to make purchases (Goel, 2012). Various other types of plastic cards provided by banks in India are ATM cards, Smart cards, Visa, master card, Rupay card (Patil 2014). The National Payments Corporation of India has launched India's own card, Rupay. Rupay cards will have lower transaction cost, address the needs of Indian consumers, protection of data in India, inter-operability between different channels and products. The Rupay cards will enhance the penetration of cards in unexplored and rural areas (NPCI, 2014). The rural and semi urban markets have good potential to grow in terms of penetration of cards, due to rising e-commerce and changes in life styles. HDFC bank, the largest issuer of credit cards in country is now issuing 25% of all credit cards in rural and semi urban areas (Chakraborty, 2013).

Plastic Currency Notes

The RBI is planning to introduce plastic currency notes in 2015. The pilot testing will be done in five cities. The pilot testing will be done in Kochi, Mysore, Jaipur, Bhubaneswar and Shimla (The Economic Times, 2014).

The non-cash transaction is gradually growing. 37% of all transactions are done in electronic mode and 63% comprise of cash transactions (Deloitte, 2014).

OBJECTIVES OF STUDY

1. To study usage of plastic money in India.
2. To evaluate debit and credit card usage.
3. To evaluate drivers and challenges in adoption of cards in India.

RESEARCH METHODOLOGY

The descriptive research approach is used in the paper. The secondary data from reliable sources, newspapers, research papers is used to analyze the trend and challenges in adoption of plastic money in India.

CARDS IN INDIA

Andhra Bank and Central Bank of India introduced credit cards in 1981 (Gurusamy 2009). Rupay card has been recently introduced in India because India is also one of the fastest growing economies in the world because the income of individuals is increasing and thus the saving and investment are growing (Business Standard, 2013).

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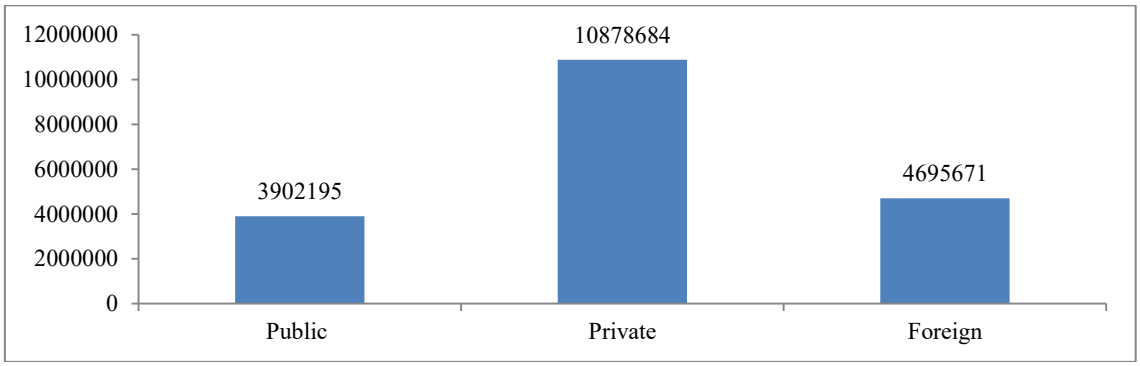
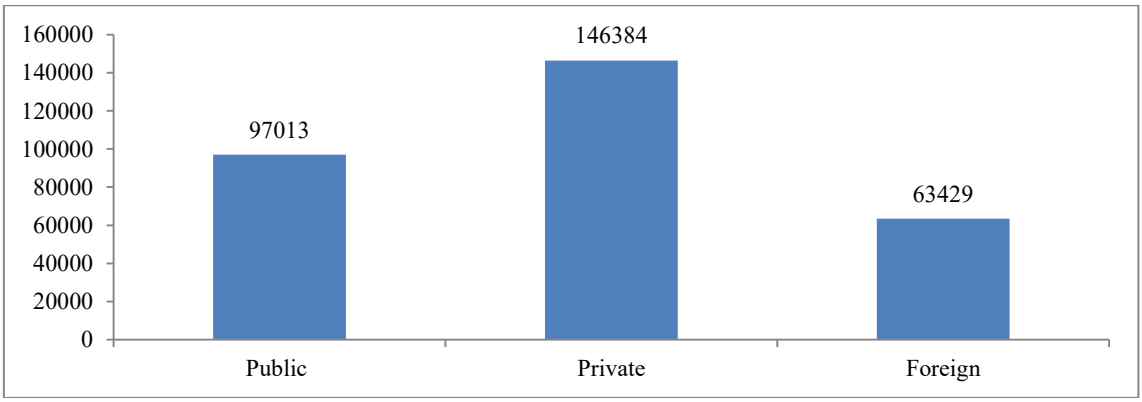
The current scenario of issuance and usage of cads is depicted in figures below. The figure 2 shows the issuance of credit cards in India. The private banks are leaders in issuance of credit cards followed by foreign and public sector banks.

Figure-1: Number of Credit Cards Issued by Banks in India (June 2014)



Sources: Reserve Bank of India, 2014

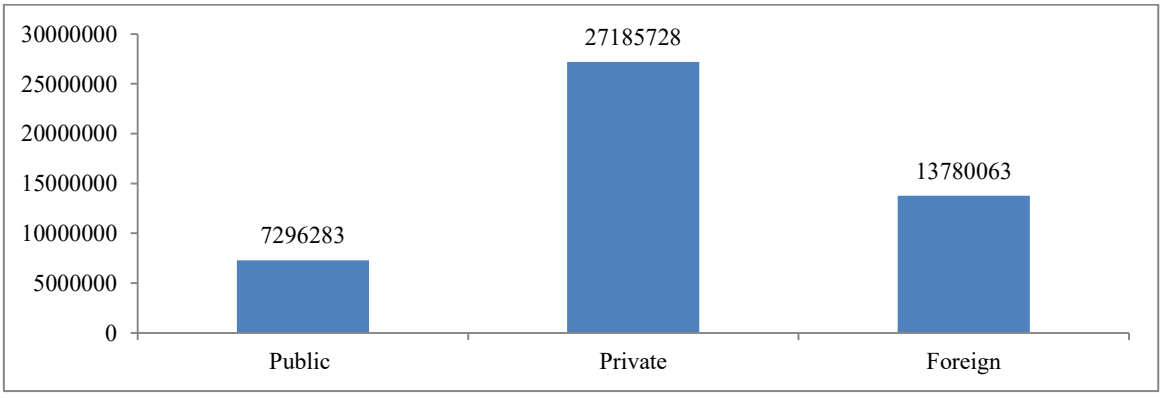
Figure-2: Number of ATM transactions of Credit Cards (June 2014)



Sources: Reserve Bank of India, 2014

The number of ATM transactions of credit cards is consistent with the number of cards issued except for foreign banks. Public banks have better usage in ATMS due to more number of ATM's as compared to foreign banks, but in POS transactions, foreign cards have better usage as compared to public sector banks as shown in figure-3, 4.

Figure-3: POS Transactions of Credit Cards



Sources: Reserve Bank of India, 2014

The public banks have emerged as the leaders in debit cards (figure-5) due to better acceptance of these cards by a conservative Indian consumers and wide branch network of public sector banks.

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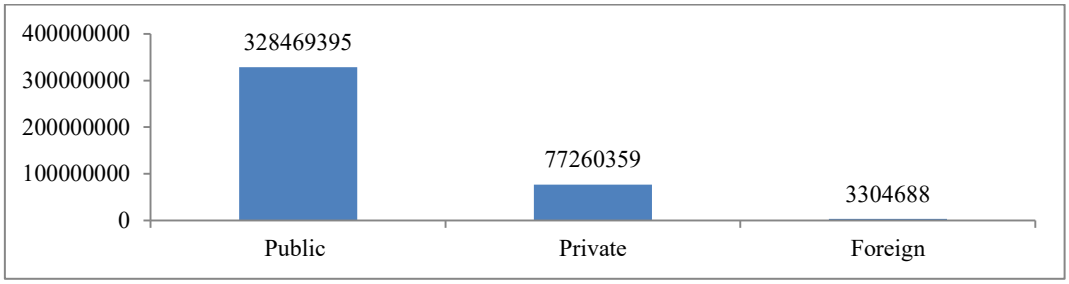
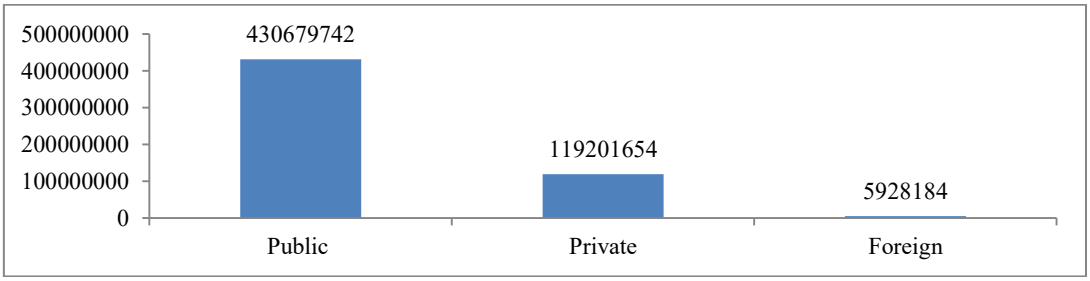
Figure-4: Debit Cards Issued in India by Banks (June 2014)



Sources: Reserve Bank of India, 2014

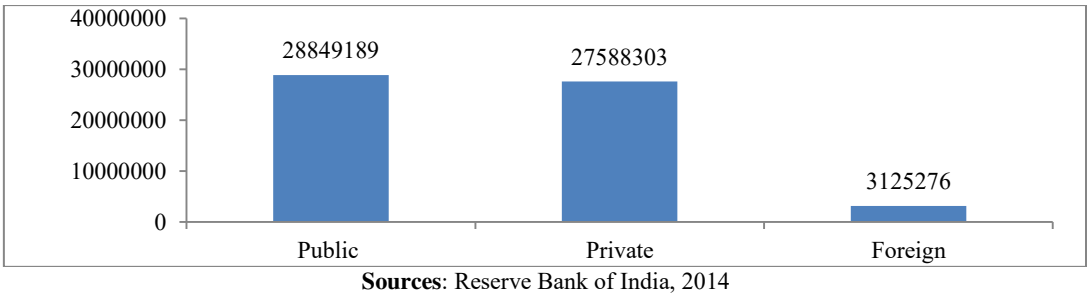
The ATM and POS transactions of debit cards shown a usage pattern proportionate to the cards issued by public, private and foreign banks as shown in figure 6 and 7. The public sector banks are leaders followed by private and foreign banks.

Figure-5: ATM Transactions of Debit Cards



Sources: Reserve Bank of India, 2014

Figure-6: POS Transactions of Debit Cards

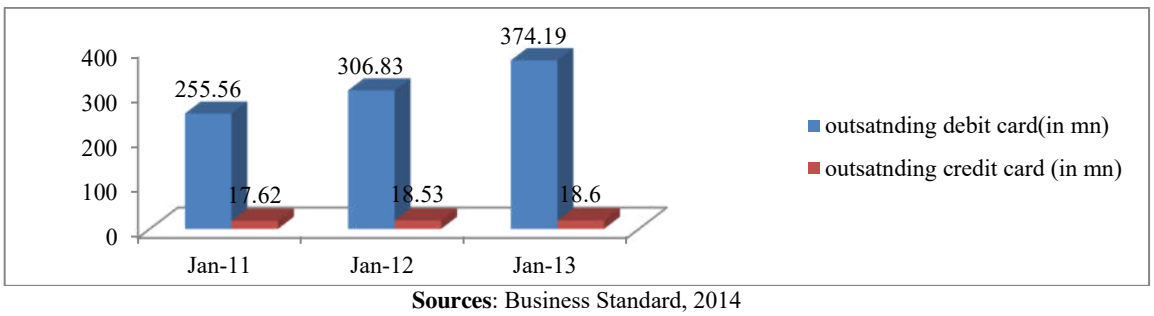


Sources: Reserve Bank of India, 2014

DRIVERS OF PLASTIC MONEY USAGE

a) **E-Commerce:** Plastic money in the form of cards provides the convenience of shopping online. Customers are increasingly using their cards to make purchases online, as shown in figure 8 (Business Standard, 2014)

Figure-7: Shopping with Debit Cards on Rise



Sources: Business Standard, 2014

Tripathi & Marwah (2013) concluded the proportion of single cardholders has grown most in India in 2011 at 90 per cent. The second was the Philippines with 84 per cent, followed by Malaysia (80 per cent). Various consumer classes perceive the use of cards differently. Women might be bigger spenders than men, but they use their debit cards less frequently.

b) Favorable Demographic Profile: The country is having a predominantly young demographic profile. The young people prefer to adopt latest technology and thus will enhance the usage of cards. India has 65% of its population 35 years or below (Virmani, 2014).

c) Growth in number of bank accounts: The JanDhan scheme of BJP government has added 49886202 new accounts in rural and 33998399 accounts in urban areas. The account holders have been issued 53201826 Rupay debit cards (PMJDY, 2014). The JanDhan scheme will improve financial inclusion and improve debit card penetration.

d) Growing Middle Class: Growing middle class will support the use of cards. It is expected that by 2030 India will have largest middle class spending in the world with spending of USD 13 trillion (Deloitte, 2014).

e) Information Technology: The growth of information technology is a big support for adoption and cost effective management of plastic money and its transactions.

REVENUE STREAM FROM PLASTIC MONEY

Banking institutions typically charge a monthly account-keeping fee and, sometimes, a fee per transaction. In the case of payments using a credit card, financial institutions usually charge an annual fee rather than as per transaction fee, and interest is charged on borrowings that are not repaid by a specified due date. Customers receiving payments are also typically charged by their financial institutions (Schmalensee, 2011). The fee charged is rental fee for terminal and per transaction fee.

Furthermore, interchange fees work differently in the international (MasterCard and Visa) card schemes and the local debit card system. In the MasterCard and Visa card schemes, interchange fees are paid by the merchant's financial institution to the cardholder's financial institution every time a payment is made using a MasterCard or Visa card.

ADVANTAGES OF PLASTIC MONEY

a) **Convenience**: Plastic money provides easy way to make financial transactions, without carrying cash. It also provides the benefits of anywhere and anytime banking.

b) **Check Counterfeiting**: The proposed plastic currency notes will reduce the chances of counterfeiting.

c) **Long life of Plastic Currency Notes**: The proposed plastic currency notes will have life of five years as against one-year life of paper currency notes.

d) **Check on Black Money**: It is possible to trace the financial transactions done through cards. Developing a culture of plastic money will make it easy for government to trace black suspected black money sources.

e) **Supports Growth of e-commerce**: The use of cards has supported the growth of e-commerce. Growth of e-commerce enhances cost effectiveness and alternative channels to improve economic growth.

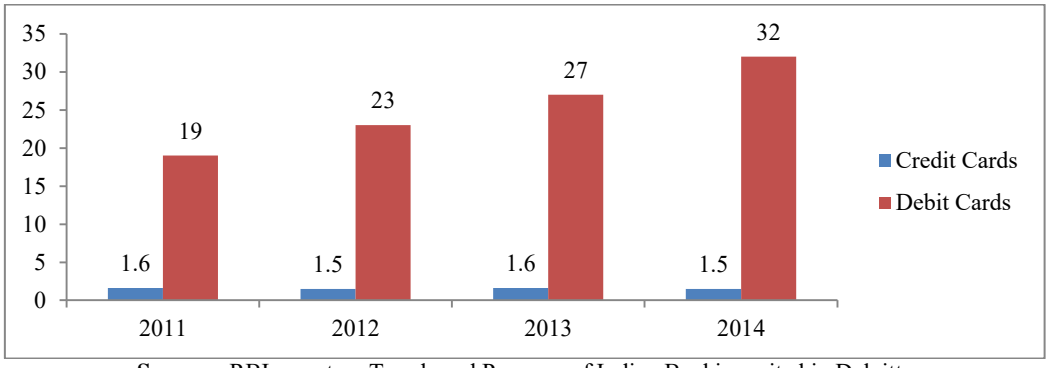
CHALLENGES IN ADOPTION OF PLASTIC MONEY

People do not prefer much use of plastic money because of high rate of interest and fraudulent transaction and increased burden of debt on consumers (Patil, 2014). This involves different type of risk that is physical risk, financial risk, performance risk, social risk. The cultural factors also restrict the use of plastic money like credit cards. The conservative nature of people restricts the adoption of credit cards.

Preference of Debit cards over credit cards: From the banker point of view the preference of debit cards over credit cards, limits the earning potential of banks. It is found that almost 80% or about 1.04 million (10.4 lakh) users are not paying any interest on credit cards, leaving all issuers with only 260,000 (2.6 lakh) users from whom banks can earn some money (Bhosale & Karbhar, 2013).

Figure 9 shows the growth trend of credit and debit card. The percentage of population using credit cards are stagnant at 1.5%, whereas percentage of population using debit cards has increased from 19% in 2011 to 32% in 2014.

Figure-8: Credit and Debit Cards Comparative Growth (% of people using cards)



Sources: RBI report on Trends and Progress of Indian Banking, cited in Deloitte

The servicing of ATM's is not up to the mark. Parvin, Hossain (2010) found that users are less satisfied with the network services. However, sometimes customers are facing many problems such as lack of availability of money, network problems, and lack of desired notes denominated securities and so on.

Frauds: cloning of cards has emerged as a major type of fraud committed to cardholders. In Chandigarh 351 cases of credit and debit card fraud were reported in 2013 (Duggal 2014). An Indian businesspersons was found to be involved in biggest ever credit card fraud in America involving USD 200 million (The Indian Express, 2014).

CONCLUSION

Plastic money is getting the acceptance from consumers due to the convenience and life style symbol. The banks are targeting the card segment to penetrate into unexplored areas and enhance the alternative revenue steam. The launch of Rupay provides the opportunity for Indian banking system to reduce the dependence on foreign card providers. The flexibility and cost effectiveness of Rupay cards will enhance the penetration of cards in India in rural and semi urban areas. The supportive policy framework of BJP government may also enhance the financial inclusion and adoption of cards with schemes like Jan Dhan Yojana. The information technology and mobile penetration is another supportive aspect to help reduce the cost of operation and expand the reach of cards. The cards have the scope of enhancing transparency in overall financial transactions and make growth more inclusive.

REFERENCES

1. Bhosale, P., & Karbhar, A. (2013). ***Credit Card Usage in India.*** Retrieved 06 September, 2014 fromhttp://www.asmgroup.edu.in/incon/publication/incon13-gen-002.pdf

2. (2013). Plastic money grew 2.1% in September. ***Business Standard.*** Retrieved on 25 October, 2014 from http://www.business-standard.com/article/finance/plastic-money-grew-2-1-in-september-113102501014_1.html

3. Chakraborty, S. (2013). ***Plastic money gains acceptance in rural India, Business Standard.*** Retrieved on 01 December, 2014 from http://www.business-standard.com/article/finance/plastic-money-gains-acceptance-in-rural-india-113071000766_1.html

4. Deloitte. (2014). ***mPay Insights 2014: Translating to Transactions.*** Retrieved 01 December, 2014 from https://www2.deloitte.com/content/dam/Deloitte/in/Documents/financial-services/in-fs-m-pay-insights-noexp.pdf

5. Duggal, J. (2014). Cybercrime cell received 1,166 complaints of credit or debit card fraud in 2013. ***The Indian Express.*** Retrieved on 03 November, 2014 from http://indianexpress.com/article/cities/chandigarh/cyber-crime-cell-received-1166-complaints-of-credit-or-debit-card-fraud-in-2013/

6. Goel, S. (2012). ***Financial Services***. New Delhi: PHI Learning Private Limited.

7. Gurusamy, S. (2009). ***Financial Services.*** New Delhi: Tata McGraw Hill.

8. Patil, S. (2014). Impact of Plastic Money on Banking Trends in India. ***International Journal of Management Research and Business Strategy***, 3(1). Retrieved on 25 October, 2014 from http://www.ijmrbs.com/ijmrbsadmin/upload/IJMRBS_5302355830503.pdf

9. Jan-Dhan, Yojana. (2014). Accounts Opened & Rupay Cards Issued under PMJDY (Date wise Incremental Data). Retrieved on 01 December, 2014 from http://www.pmjdy.gov.in/AccountBalanceSummary.aspx

10. (2014). ***Wise ATM/POS/Card Statistics. Reserve Bank of India Bank***. Retrieved on 1st December 2014 from http://rbi.org.in/scripts/ATMView.aspx

11. Schmalensee, Richard, & Evans, D. (2005). ***The economics of interchange fees and regulation: An overview MIT Sloan working paper No.4548-05.*** Retrieved 29 August 2014 from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=744705

12. (2014). RBI planning to introduce plastic currency notes next year ***(The Economic Times).*** Retrieved on 28 November, 2014 from http://articles.economictimes.indiatimes.com/2014-08-22/news/53112856_1_plastic-currency-notes-bank-notes-pilot-testing

13. (2014). Indian pleads guilty in USD 200 mln credit card fraud scheme ***(The Indian Express).*** Retrieved 05November, 2014 from http://indianexpress.com/article/india/india-others/indian-pleads-guilty-in-usd-200-mln-credit-card-fraud-scheme/

14. Tripathi, V., & Marwah, T. (2013). ***Demographic differences & shopping behavior of Indian middle income group users with debit cards: An empirical analysis Asian Journal of Research in Business Economics and Management,*** 3(6). Retrieved on 29 October, 2014 from http://www.indianjournals.com/ijor.aspx?target=ijor:ajrbem&volume=3&issue=6&article=004

15. Virmani, P. (2014, April 8). ***Note to India's leaders: your 150m young people are calling for change,*** The Guardian dated. Retrieved on 5th September 2014 from http://www.theguardian.com/commentisfree/2014/apr/08/india-leaders-young-people-change-2014-elections

16. Retrieved from http://archive-au.com/au/g/gov.au/2012-05-08_364_109/RBA_Bulletin_September_Quarter_2010_Structural_...

17. Retrieved from http://connection.ebscohost.com/c/articles/88905859/demographic-differences-shopping-behavior-indian...

18. Retrieved from http://creditsudhaar.blogspot.in/2014/01/cyber-crime-cell-received-1166.html

19. Retrieved from http://econpapers.repec.org/RePEc:mgn:journl:v:6:y:2013:i:6:a:6

20. Retrieved from http://www.moneymantra.co.in/detailsPage.php?id=6475&title=Banking&page=bank

21. Retrieved from http://www.rba.gov.au/publications/bulletin/2010/sep/7.html

22. Retrieved from http://www.slideshare.net/indernegi921/plastic-money-33457540

23. Retrieved from http://www.thehindubusinessline.com/industry-and-economy/banking/number-of-credit-card-holders-fell-...

24. Retrieved from https://ideas.repec.org/a/mgn/journl/v6y2013i6a6.html

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ENHANCING SOCIAL SECURITY THROUGH CYBER SECURITY FOR CYBER CAFE: IMPLICATION FOR PUNE CITY

Manisha M. Maddel[26] Dr. Vilas D. Nandavadekar[27]

ABSTRACT

The Global Information Infrastructure creates unlimited opportunities for commercial, social and other human activities. Cyber cafe plays a crucial role in the use of the Internet for business necessitates and personal use. Social security on the internet gives assurance to the internet users for trust and they can feels free from insecurities, disagreements, inefficiencies and communication breakdown.

Social security of citizens visiting cyber cafe can be enhanced if proper cyber security for cyber cafe are done. The awareness of cyber security is a necessary part for all cyber cafe shopkeepers. This paper gives an overview of physical and electronic security implemented in cyber cafe in Pune city. In electronic security the security at application level and network level are considered. The paper also focuses on problems in implementing the cyber security and gives suggestion to manage it. The security measures taken by cyber cafe were observed in an in-depth study of 23 cyber cafes.

KEYWORDS

Cyber Cafe, Cyber Security, Cyber Crime, Social Security etc.

INTRODUCTION

Today Information and Communication Technologies (ICT) are generating a new industrial revolution. Technological progress now enables us to process, store, retrieve, and communicate information in whatever form it may take, unconstrained by distance, time, and volume. With increasing ICT, diffusion leading to routine usage opportunities for unethical behavior in cyber space has been also on the increase. Security on the Internet is interdependent. The risk of cyber-attack on every computer systems on the internet depends upon the Network security and security state of the system along with the systems attached to it and the global internet. Some of the Internet frauds causing insecurity are financial institutions fraud, gaming fraud, communications fraud, utility fraud, insurance fraud, government fraud, investment fraud, business fraud, and confidence fraud.

In today's Internet world, Social Security means assurance of reliable, accurate and timely information dissemination on internet, nonexistence of criminal acts and criminal tendencies even when people are not in direct contacts with one another. Social security existence assures people to trust other individuals with whom they come across in on the internet. Social security for cyber cafe visitors can be put into operation if cyber security is imposed at a greater extent in cyber cafe. The researcher in this paper focuses on cyber security in terms of physical security & systems electronic security. It lists the measures taken by cyber cafe shopkeepers to prevent cybercrime. The study put fourth's preventive measure that should be taken by shopkeepers and visitors of the cyber cafe.

Cyber Cafe

An Internet cafe or cybercafé is a place, which provides internet access to the public, usually for a fee. It includes any commercial establishment or Internet kiosk, the objective of which is to make Internet services available to the public. It is a place where computers that are connected using the wide area network (WAN) and then hooked to an Internet service provider who renders Internet services to users. The fee for using a computer is usually charged as a time-based rate. Cyber cafe is considered to be a "Place of Public Amusement "as defined under section 2 (9) of the Bombay Police Act, 1951" (Act XXII of 1951).Cyber Cafe license is allotted only after checking if all norms provided by the government are fulfilled.

Currently in Pune, there is 358-licensedcybercafé. 43 are in process of being licensed. Form the observation it was seen that there are many cyber cafes without license. For the study purpose 23 cyber cafe under different zones are studied.

Social Security and Cyber cafe Cyber Security

In today's world the need of online business is getting faster attention for many reasons such as operations have becomes cost effective, time saver, increased and improved productivity ,numerous options to compare and made management more easier. As per the survey done around 40% of world, population has internet connection today. Online customers are increasing day by day. Along with business social networking, gaming, researches are also the other perspectives, which can be considered in increase of

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internet users. From social security point of view, the internet users should be free from fear of being hacked or getting their data misused or falling prey of cybercrime and becoming a cybercrime attack victim. Trust, transparency and privacy play a major role in any business. Perfect online social security can be achieved if we impose perfect cyber security since they both go hand in hand.

Cyber Security

Cyber security is the activity or process, ability or capability, or state whereby information and communications systems and the information contained therein are protected from and/or defended against damage, unauthorized use or modification, or exploitation. Cyber cafe security can be discussed based on two things:

- ***System Security***- Implementations of security measures for hardware and software for the system to protect from unwanted cyber security problems.

- ***Network Security*** - Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources.

NEED AND SIGNIFICANCE OF THE STUDY

Cyber security is a major concern for any government in today's world, which can be used easily to breach and attacked by cybercriminal through cyber cafe affecting the social security of the people in society. If proper cyber security is not implemented in the cyber cafe, it is very easy for the attackers to access the data and perform illegal act. Awareness among shopkeepers about cyber security plays a vital role in cyber security implementation and protecting social security there by reducing cyber-criminal acts.

STATEMENT OF PROBLEM

Internet Cafe is presently the common and simplest gateway to reach entire world. Internet has become a very useful medium for business of different patronage from clients of different classes or race. However, along with these there is also increase in the criminal activity on internet with criminal intentions for which cyber cafe are the most favorite place that is used by attackers. The shopkeepers or operators and visitors of cyber cafe face serious cyber security challenges on the internet. The shopkeepers face difficulties to consider all angles of cyber security in Internet cafes such as Physical Security, Operational level security, Application level Security and Network Level security.

METHODOLOGY OF RESEARCH

Methodology that was used for this study has been chosen in order to acquire information and deduce conclusions about cyber security implemented in cyber cafe at different levels and problems faced by them while implementing cyber security. Survey based research methodology was used to carry out the research in Pune city. The goal of this study is to provide study, identify cyber security implemented at physical level, application level and Network level by cyber cafe shopkeepers in their cafe, and provide information for addressing cyber security issues in Internet cyber cafe

Research Objectives

Below are the objectives of this research:

- To study and identify cyber security implemented by shopkeepers or operators of cyber café.
- To identify the problems that Internet cafe shopkeepers face in implementing cyber security.

Research Hypothesis

- Cyber cafe shopkeepers are aware about cyber security implementation in cyber cafe and shopkeepers install antivirus in cyber cafe for cyber security.

Data Collection Method

For the purpose of this research and in order to achieve the objectives of this research, both primary and secondary data was collected. Data collection was done from various cyber cafes in Pune city from various zones. The data collected provided the researcher to find the major factors considered while implementing cyber security in cafe and their problems faced by them and to understand the ultimate findings of the research. For data collection, Questionnaires and Observation methods were used. For observation purpose, the researcher has visited the internet cyber cafe as customer.

Sampling

The researcher delivered the questionnaires at 35 Internet cafes in Pune city. The aim of the researcher was to get at least 20 cyber cafe shopkeepers or operators of Internet cyber cafe. 23 shopkeepers responded in the survey.

FINDINGS AND DATA ANALYSIS

Physical Security Techniques used in Cyber Cafe

System security can be considered in two parts physical security and software security. For physical security points such as locking of PC cases, Break glass alarm sensor, lock opening windows, Detectors, Intruder Alarm sensor on Access Router and Servers and modems to be kept in separate rooms were taken into consideration for data collection from 23 cyber cafes.

Table-1: Physical Security Techniques used in Cyber Café

Sr. No.	Physical Cyber Security	Number of Respondents		Total
		Yes	No	
1	Locking of PC Cases	1	22	23
		(4.35)	(95.65)	100
2	Break Glass alarm sensor	0	23	23
		(0)	(100)	100
3	Lock Opening Windows	6	17	23
		(26.09)	(73.91)	100
4	Detectors	0	23	23
		(0)	(100)	100
5	Intruders Alarm Sensor on Access Router	2	21	23
		(8.6)	(91.4)	100
6	Separate Server	1	22	23
		(4.35)	(95.65)	100
Total		53.39	128	
Average Percentage		(7.58)	(92.41)	

Note: Figures in bracket indicates Percentages
Sources: Authors Compilation

It is seen from the table that physical security is not taken care about in cyber cafe and is neglected. 95.65 percent of shopkeepers lock PC cases are not locked, 100 percent do not have Break glass alarm sensor, and 73.91 percent do not have Lock Opening Windows, 100 percent do not have detectors, 91.4 percent do not have Intruders Alarm sensors on Access Router and 95.65 percent do not have separate Server rooms.

A Cyber cafe owner takes less effort in implementing physical cyber security for cyber cafe. The reasons observed during interviews were that finance required to implement it is high. In recent years due to increase in internet facility on household front and on Mobile the visitors to cyber cafe has decreased. This leads to less profit for shopkeepers and so physical cyber security is not paid attention by them.

Application Level Cyber Security

For Application level security, points such as licensed software, Antispyware software, Antivirus, Endpoint security software and firewall, control panel access restriction, physical drive restriction, security option access restriction, blocking illegal installation and setup files were considered along with updated software is including operating system that was implemented for terminals.

It was observed that time and date were not set for terminals and it was not same for the entire terminals.

It was also observed that cyber cafe shopkeepers used various freeware cyber cafe management software for cyber cafe management such as setting up firewall, managing billing, blocking setup files, content filter, handling browser security and many others.

Table-2: Cyber Security Techniques used in Cyber Café

Sr. No.	Cyber Security Techniques Used	Number of Respondents		Total
		Yes	No	
1	Antivirus	23	0	23
		(100)	(0)	(100)
2	End point security software	16	7	23
		(69.56)	(30.44)	(100)
3	Antispyware software	13	10	23
		(56.52)	(43.48)	(100)
4	Firewall	17	6	23
		(73.91)	(26.09)	(100)
6	Control panel access restriction	11	12	23
		(47.82)	(52.18)	(100)
7	Browser security option restriction	9	14	23
		(39.13)	(60.87)	(100)
8	Physical drive restriction	10	13	23
		(43.47)	(56.53)	(100)
9	Blocking installation and setup files	9	14	23
		(39.13)	(60.87)	(100)

Note: Figures in bracket indicates Percentages
Sources: Authors Compilation

Network level Cyber Security

For Network security points such as Network Firewall, Network access control, Remote client monitoring, UTM device, Website keyword blocking, router password management and content filter were considered.

It is seen from the table, 100 percent have antivirus software installed, 69.56 percent have end point security software installed, 56.52 percent have Antispyware software installed, 73.91 percent have Firewall settings done and kept ON.47.82 percent have control panel access restriction settings done, 39.13 percent have done Browser security option restriction done, 43.47 percent have physical drive restriction done and 39.13 percent have blocked installation and setup files.

Table-3: Network Cyber Security Techniques used in Cyber Café

Sr. No.	Network Cyber Security Techniques Used	Number of Respondents		Total
		Yes	No	
1	Network Access control	19	4	23
		(82.6)	(17.4)	(100)
2	Change in router username password	15	8	23
		(65.21)	(34.79)	(100)
3	Remote client monitoring	14	9	23
		(60.86)	(39.14)	(100)
4	UTM	4	19	23
		(17.3)	(82.7)	(100)
5	Website keyword blocking	14	9	23
		(60.86)	(39.14)	(100)
6	Content filter	5	18	23
		(21.73)	(78.27)	(100)

Note: Figures in bracket indicates Percentages
Sources: Authors Compilation

It is seen from the table, 82.6 percent have network access control, 65.21 percent change their router username and password frequently, 60.86 percent have remote client monitoring, 17.3 have UTM software and device installed, 60.86 percent have website keyword blocking and 21.73 percent have content filter implemented in cyber cafe.

Hypothesis Testing

Various statistical tools are used to test the hypotheses. If the replies of a majority of the respondents support a hypothesis then that hypothesis will be considered as confirmed. Otherwise, it will be considered as rejected.

Hypothesis: Cyber cafe shopkeepers are aware about cyber security implementation and most of them install antivirus in cyber cafe for cyber security.

This hypothesis has been tested by using t test because sample size is less than 30. For testing this hypothesis, researcher first identifies awareness of cyber cafe owner regarding cyber security in cyber cafe and then it focuses how they maintained security in cyber cafe.

Null and Alternative hypothesis

H_0: Cyber cafe shopkeepers are unaware about cyber security implementation and installation of antivirus in cyber cafe for cyber security
H_1: Cyber cafe shopkeepers are aware about cyber security implementation and most of them install antivirus in cyber cafe for cyber security.

Table-4: One sample Statistic of Cyber Cafe Owner Awareness

Cyber Security Factors	N	Mean	Std. Deviation	Std. Error Mean
Antivirus	23	.96	.209	.043
Endpoint Security software	23	.70	.470	.098
Antispyware software	23	.57	.507	.106
Firewall	23	.74	.449	.094
Network Access control	23	.83	.388	.081
Control panel access restriction	23	.48	.511	.106
Browser security option restriction	23	.48	.511	.106
Physical drive restriction	23	.48	.511	.106
Security option access restriction	23	.74	.449	.094

Sources: Authors Compilation

Most of the cyber cafe shopkeepers are aware about cyber security, which is reflected by the use of various cyber security techniques they use for implementing cyber security. Factors such as installation of Antivirus software which covers most of the threats coming under way such as viruses, worms, botnets and many others along with End point security software on every users machine, Antispyware software which now generally come with antivirus software, firewall implementation on server as well as terminals, Restriction to control panel so that change in software or installation of software cannot be done or changing the setup cannot be done, restriction to browser security, access to physical drive restriction along with network and application level security options are restricted so that illegal access to the network can be avoided.

Mean and Standard deviation of all these factors is very high and hence we can say that most of the cyber cafe shopkeepers are aware about cyber security and they take precaution to maintain security. By comparing all awareness factors, installation of antivirus is highly used by Shopkeepers of cyber cafe to main security. For testing of hypothesis, researcher has used one sample t-test and statistics of this test has shown in following Table-5.

Table-5: t-test Statistics of Antivirus to maintain Cyber Security

Test Value = 0					
t	d.f.	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
22.000	22	.000	.957	.87	1.05

Sources: Authors Compilation

As per the Table-5, t-statistic of use of antivirus to maintain cyber security is 22.000 with 22 degree Freedom of with 5 percent level of significance. Calculated p value is 0.000, which is less that 0.05 at 5 percent level of significance. Hence, here is enough evidence to reject null hypothesis and accept alternation hypothesis "Cyber cafe shopkeepers are aware about cyber security implementation and most of them install antivirus in cyber cafe for cyber security". Hence, **Hypothesis of the study is accepted** that **"Cyber cafe shopkeepers are aware about cyber security implementation and most of them install antivirus in cyber cafe for cyber security".**

CONCLUSION AND SUGGESTION

There are many hurdles for implementing cyber security in cyber cafe and thus difficult to have social security. Improving the cyber security will enhance the cyber security. Cyber cafe shopkeepers are aware about implementing cyber security in cyber cafe but they do not complete lack of knowledge to do the maintenances for cyber security. The operators of cyber cafe are not having enough security expertise to handle attack. Instead, they rely totally on the software, which is mostly freeware software. Such software's have inadequate functionality to handle cybercrime attacks. Attackers to attack other systems without the knowledge of the operator can easily use such systems. Thus proper training should be ascertain by cafe shopkeepers or operators to know about implementation of cyber security .They should have enough expertise of the software they are using to understand what it is doing and how to handle it if something goes wrong.

Secondly due to the lack of finance and less profit the shopkeepers even though aware of updating of software, operating system patches and updates ,renewing or installing antivirus or antispyware software's are not done by them. Failure to update system software exposes security gap for intruders. A regular time like every third week of the month should be set aside to apply the latest updates. It is seen that the server room and modem are kept openly which is risky as visitors can access the server. Illegal software should not be used such as Deepfreeze software, which the Indian government has already banned. Use of hidden camera should be there but was seen at less cyber cafe. Full trace of intrusion could be kept of the system activity at the ISP levels so that when a security breach occurs, the mechanism and extent of breach could be determined. This can be adopted on a global network, wherein, computer or cybercafé events can be monitored so that such a security breach can be trapped when it occurs. Thus, implementation of proper security techniques at application level and Network level along with the shopkeepers or operators security knowledge up gradation and following cyber security policies put forth by the government will help to avoid cyber-attacks and improve social security.

REFERENCES

1. Bangemann, M. et. al. (1994). ***Europe and the global information society: Recommendations to the European council*.** Retrieved from June 12, 2006.

2. Rittinghouse, J. N., & Hencock, W. M. (2003).***Cyber security operations [handbook].*** Amsterdam: Elsevier Digital Press.

3. Simmonds, A., Sandilands, P., Van, Ekert L. (2004). An Ontology for Network Security Attacks. *Lecture Notes in Computer Science*. Lecture Notes in Computer Science 3285: 317–323. doi:10.1007/978-3-540-30176-9_41. ISBN 978-3-540-23659-7

4. Bolding, D. (2007). ***Network security, filters and firewalls,*** pp. 1 of 3. Retrieved from http://www.acm.org/crossroads/xrds2~1/security.html.

5. Adomi, E. E., Adogbeji, O. B., & Oduwole, A. A. (2005). The use of Internet service providers by cyber cafes in Nigeria: An update. ***The Electronic Library*****,** *23*(5), 567-576.

6. Curtin, M. (1997). ***Introduction to network security*.** Retrieved from http://www.interhack.net/pubs/network-security/

7. Hawking, S., Yen, D. C., & Chou, D. C. (2000). Awareness and challenges of Internet security. ***Information Management and Computer Security,*** 8(3), 131-143. Retrieved (Basic Internet cafe requirement) (n.d.). From http://www.ccautosoft.com/internet-cafe-guide/index.php

8. Retrieved from http://www.internetlivestats.com/internet-users/

9. Retrieved from http://www.emerald~library.com

10. Retrieved from http://answerparty.com/question/answer/where-can-i-go-for-public-access-to-a-computer-other-than-the...

11. Retrieved from http://en.wikipedia.org/wiki/Network_security

12. Retrieved from http://en.wikipedia.org/wiki/Computer_network

13. Retrieved from https://www.sputnik7.com/services/network-security

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STRESS MANAGEMENT FOR EMPLOYEES

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ABSTRACT

Stress has come to stay as an unavoidable condition of modern life. In addition, it has become a part of organizational life all over the world. Naturally 'stress' forms an important part of the study of Organizational Behavior. It is the most discussed topic among both the busiest physicians and their most affluent patients. Today stress is considered and accepted as the chief cause of all of the psychosomatic diseases. We may even say that stress is the most silent killer of the century. However, the reality is that many of the victims of stress are still not aware of the fact that they have been adversely impacted by the most dreaded non-bacterial cause of many of the major diseases prevalent among humans today. Everyone at one stage or other of one's life has been impacted by stress. In other words, nobody requires an introduction to the phenomenon called stress.

KEYWORDS

Stress Management, Stress, etc.

INTRODUCTION

The concept of stress first introduced in the life sciences in 1936 by Hans Selye. Stress can be explained as pressure up on a person's psychological system. Though stress is upon psychological setup, it affects his or her physical and behavioral system. The word stress is derived from the Latin word "stringers", meaning to draw tight. Stress has become buzzword in 21st century. Every material like steel, rock or wood has its own limit to withstand stress without being damaged. Similarly, human being can tolerate certain level of stress. It is highly individualistic in nature. For every individual there is optimum level of stress under which they perform very well. If the stress is below optimum level then the individual feels bored, motivational level becomes low, may do careless mistakes and result in absenteeism. On the other hand stress is above the optimum level, it results in too many conflicts, increase in errors, bad decisions and many experience physical illness.

Good Stress and Bad Stress

The stress response is critical during emergencies, such as when a driver has to slam on the brakes to avoid an accident. It can also be activated in a milder form at a time when the pressure's on but there's no actual danger like stepping up to take the foul shot that could win the game, getting ready to go to a big dance, or sitting down for a final exam. A little of this stress can help keep you on your toes, ready to rise to a challenge. In addition, the nervous system quickly returns to its normal state, standing by to respond again when needed. However, stress does not always happen in response to things that are immediate or that are over quickly. Ongoing or long-term events, like coping with a divorce or moving to a new neighborhood or school, can cause stress, too. Long-term stressful situations can produce a lasting, low-level stress that is hard on people. The nervous system senses continued pressure and may remain slightly activated and continue to pump out extra stress hormones over an extended period. This can wear out the body's reserves, leave a person feeling depleted or overwhelmed, weaken the body's immune system, and cause other problems.

SOURCES / CAUSES OF STRESS

The factors leading to stress among individual are called as stressors. Some of the factors/stressors acting on employees are:

Organizational Factors: With the growth in organizational stress and complexity, there is increase in organizational factors also which cause stress among employees. Some of such factors are:

- Strict rules and regulations,
- Ineffective communication,
- Peer pressure,
- Goals conflicts/goals ambiguity,
- More of centralized and formal organization structure,
- Less promotional opportunities,
- Lack of employees participation in decision-making,
- Excessive control over the employees by the managers.

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***Individual Factors*:** There are various expectations, which the family members peer, superior and subordinates have from the employee. Failure to understand such expectations or to convey such expectations lead to role ambiguity/role conflict, which in turn causes employee stress. Other individual factors causing stress among employees are inherent personality traits such as being impatient, aggressive, rigid, feeling time pressure always, etc. Similarly, the family issues, personal financial problems, sudden career changes all lead to stress.

***Job Concerning Factors*:** Certain factors related to job which cause stress among employees are as follows:

- Monotonous nature of job
- Unsafe and unhealthy working conditions
- Lack of confidentiality
- Crowding

***Extra-organizational Factors*:** There are certain issues outside the organization, which lead to stress among employees. In today's modern and technology savvy world, stress has increased.

STRESS MANAGEMENT

Stress management refers to a wide spectrum of techniques and psychotherapies aimed at controlling a person's levels of stress, especially chronic stress, usually for improving everyday functioning. Stress produces numerous symptoms, which vary according to persons, situations, and severity. These can include physical health decline as well as depression. The process of stress management is one of the keys to a happy and successful life in modern society. Although life provides numerous demands that can prove difficult to handle, stress management provides a number of ways to manage anxiety and maintain overall well-being.

SIGNIFICANCE OF STRESS MANAGEMENT

When we are practicing stress management, we will learn how to control our emotions so that people will not think of us as an over-reactor, but we will also be able to control our mind to stay positive. Since the first step to stress management is to identify stress factors, the second step is to recognize the steps to help change the situation. Sometimes we are able to eliminate the problem, but most of the time, we must find ways to grin and bear it. However, we can reduce the time spend on the other causes.

We can also find ways to reduce our stress by stretching the task out over time or delegating. When it comes to stress, we need to be aware of the causes of stress and how we emotionally and physically react. If we find that our stress causes serious side effects on us like depression or if we become so nervous that makes literally sick. Some times when confronting our stress with the help of a physician, we are able to find a more effective stress management programmes. When we felt that if we lack control on ourselves, we should seek advice on stress management.

Stress management is used all over the world in many cultures to help control one's self. Stress is hard on everyone and it affects everyone at some point in his or her life. However, stress management can help relieve the side effects of stress that prevents a person from efficient living. Stress management is not only about helping you develop ways to handle the stress, but it also will put you on a path. For stress management we need to set and pursue goals that are meaningful. However, we might found that we will become frustrated or upset when the goals are not met. That is the way, with stress management, we will be able to set new goals and be successful.

Mind over mind is what stress management is all about. We not only have to think that we can handle everything within the deadlines, but we also have to be able to find self-discipline. Stress management begins with discipline because we have to find ways to calm ourselves down as well as find techniques to tackle everything that is handed to you. We all have our breaking points. The hard part is learning how to control our emotions and thoughts so that we do not reach our breaking point. That is why everyone needs to learn about stress management.

Stress management is different for everyone, but the idea is still the same. To practice stress management successfully we need to find something that allows us to let go of all our worries. Stress management is as simple as taking a walk. It has been proven that physical activities would improve a person's mental health, help with depression, and relieve the side effects of stress. You should try to exercise at least three or four times a week. In addition, we should try to avoid stimulants like nicotine or caffeine. This makes a person's heart rate increase and will be more likely to be affected by stress.

Characteristics of Stressful Work to Manage Stress

- Focus on an excessive number of things,
- Lack of closure,
- No reasonably attainable challenging goals,

- No control over meaningful goal attainment,
- Inadequate feedback to let us know how well we're doing,
- Inadequate or inappropriate use of talents.

POSITIVE STRESS MANAGEMENT PRACTICES

Time Management: Much stress is brought about by people's lack of control over their lives. Effective time management helps put people in control and allows them to spend more time with their family and friends; that in turn help them to reduce stress. So writing to-do list, prioritizing tasks from most to least important, and keeping a schedule of daily activities to minimize conflicts and last-minute rushes all are vital in reducing stress levels.

Regular Relaxation Periods: It is important that each individual set aside specific time each day to relax. Do not to let relaxation be at the mercy of work or family. Even short, quiet 30-minute breaks daily can do much to renew an individual's energy and perspective. It would be best to schedule these breaks during the most stressful times in our day.

Regular Exercise: Physical exercise is one of the most effective ways of relieving stress. It has both short and long-term effects that have a positive impact on a person's stress levels. Studies have shown that right after exercising; a surge of natural "feel good" hormones called endorphins is released. Regular physical activity improves a person's mental and physical state and makes him or her better able to combat stress.

Healthy and Balanced Diet: Good nutrition is the foundation of good health and is especially important during times of stress. A person's diet and nutrition choices can make his or her stress levels go up or down. Certain foods provide comfort and actually increase levels of the body's stress-fighting hormones. Other types of foods and beverages can reduce stress by lowering the levels of hormones that trigger it. Although there is no diet to relieve stress, eating healthy meals and avoiding caffeine, alcohol, and nicotine are the basic things to remember. A person with unhealthy stress management practices is bound eventually to suffer grave consequences. If our methods of coping with stress are not contributing to our greater emotional and physical health, it is time to change our ways and adopt the right ones. These ways may be a little difficult to follow and may require a great deal of effort, but they will bring permanent and positive changes.

CONCLUSION

Since the stress management techniques are positively related to employee satisfaction towards the job, it can be understood that every management should put efforts to design and implement any type of methods to keep employees relaxed and instill a sense of belongingness towards the organization which is lacking in today's work environment in most of the BPOs.

REFERENCES

1. Barkat, S. A., & Asma, P. (1999). Gender and age as determinants of organizational role stress. ***J.Com. Gui. Res.,*** 16(2), 141-145.

2. Chand, P. (2006). Psychological factors in the development of work stress. ***J. Com. Gui. Res.,*** 23(2), 178-186.

3. Dalal, A. K., & Ray, S. (2005). ***Social Dimensions of Health***. Jaipur: Rawar Publications.
4. Kumar, Maria B. (2005). ***Applications of Psychological Principles in Maintenance of Law and Order.*** Bhopal: Blaji Publications.

5. Paulus, P., Nagar, D., Larey, T., & Camacho, M. (1996). Environmental, Lifestyle and psychological Factors in the Health and well-being of Military families. ***Journal Applied Social Psychology,*** 26.2053-2075.

6. Srivasthava, A. K., & Sing, A. P. (1981). Construction and Standardization of an occupational Stress index: A Pilot Study. ***Journal of Clinical Psychology,*** 8, 133-36.

7. Ryhal, P. C., & Singh, K. (1996). A study of correlates of job stress among university faculty. ***Indian Psy. Rev.,*** 46(1- 2), 20-26.

8. Schuler, R. S. (1980, April). Definition and Conceptualization of Stress in Organization. ***Journal of Organization Behavior and Human Performance,*** p (189-190).

9. Retrieved from http://psychcentral.com/lib/stress-management-practices-what-works-and-what-doesnt/00011942

10. Retrieved from http://www.articlesnatch.com/Article/What-Is-Stress-Management-/87294

11. Retrieved from http://ezinearticles.com/?Understanding-Stress-Management-to-a-Highly-Effective-Working-Life&id=...
12. Retrieved from http://ezinearticles.com/?id=324583&Understanding-Stress-Management-to-a-Highly-Effective-Working-Li...
13. Retrieved from http://greenhealthinformation.com/category/stress
14. Retrieved from http://nutritionbywomen.com/2013/02/03/stress
15. Retrieved from http://blackdoctor.org/1881/healthy-foods-that-make-you-happy

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INFORMATION AND COMMUNICATION TECHNOLOGY INFLUENCE IN EDUCATION SYSTEM

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ABSTRACT

The ICT has transformed all aspects of our lives, the way we communicate, we learn, and we work. Various level of education system and development practice on quality education enhances student outcomes such as increasing knowledge in school subjects, improved attitude about learning and practices for developing new skills. The development practice can improve the students learning knowledge, skills and abilities, teaching with new skills and new pedagogy in the classroom. This paper deals with influence of ICT in schools and higher education system.

KEYWORDS

ICT, Higher Education System, Teaching Pedagogy etc.

INTRODUCTION

Things have been changed over the time. Change is the only constant in this world, be it internal or external that plays a prominent role in educational organization sector too. The accelerated advancement of technology has set into numerous advantages in teaching and learning environment. Education is just a combination of main two processes such as teaching and learning with a medium in between the two. Therefore, ICT is a diverse set of technological tools that uses to communicate, store and manage the communication and information at the very heart of the educational process. ICT has played an educational role in formal and non-formal settings, in programs provided by governmental agencies, public and private educational institutions, profit corporations and non-profit groups, and secular and religious communities [1].

ICT is often considered a radical change, agent of transformation for teaching and learning relationships in the near future. If the changes are included, initiatives must be practitioners to individual ways of teaching and learning. Initiatives must be fully resourced in terms of technical support and training and especially in terms of time for practitioners to develop sufficient confidence with ICT that they can make judgments about when it is or is not appropriate [2].

FUTURE SHOCK

We survive today in the so-called modern civilization. It is the characteristic of growing pace of change in this modernized society. There exist many enormous things that are difficult to understand but appreciate the surviving change, this impact of changes we often count as future shock. On the other hand, these fundamental changes do not appear immediately, it always a part of a historical evolution that technological accelerated development plays a part. These fundamental shifts are not out of place to cite Alvin Toffler a famous trio author who coined the term future shock about four decades ago. In dealing with the future, at least we need to know the purpose and usefulness of all these change agents at hand and more important to be imaginative and insightful than to be hundred percent "right" as it elicit condescending smile today. We believe that ICT will be a key factor in future positive change – provided they are in the possession of people who use them creatively and for the common good [3].

INFLUENCE OF LIFELONG LEARNING

Over the many years education across the country, it has increasingly aware with a number of changes that are taking place in the world today. Education today is widely seen as a continuing activity-taking place throughout the lifespan. Establishing lifelong learning habits among citizens gives a lifelong learning opportunity that has become a major goal of government initiatives worldwide [4].

Education is about imparting the knowledge and building character and empowering each individual to be an enthusiastic lifelong learner in the future of globalization. ICT can enable both in teaching and learning from anywhere at any time and it is seen as an effective means to provide lifelong educational opportunities. Lifelong learning is thought to be important for at least two reasons [1]. First, it is no longer possible to master an entire discipline in a few short years. The amount of information available and the speed at which new information is being created makes this impossible. Second, career changes are becoming more frequent.

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In today's speedy globalization technology bring several major changes that lead the educator to recognize the need for the change. It is widely recognized that lifelong learning has become as an essential in today fast changing world driven by the new dimension of science and technology. Fortunately, we now have a new tool that can make much more readily possible type of education. The World Wide Web is being used as a direct teaching tool that allows virtual classrooms of interacting students and faculty to be created through "asynchronous learning networks [5]". Many examples of how ICT is being used to encourage lifelong learning can be found. In Great Britain, the Department for Education and Employment [6] has established a "UK Lifelong Learning" website [7] that provides news, reports, and lists of lifelong learning opportunities. Earlier, the Dutch government launched a national program for lifelong learning "to ensure that better use of the country's intellectual resources."

The European Lifelong Learning Initiative [8] makes use of ICT, "to initiate the dissemination of information, the co-ordination of projects and studies, the mobilization of actions, people and organizations to bring Europe into the Lifelong Learning Age. It covers all sectors and all countries [9]. The Asia Pacific Economic Cooperation (APEC) Forum has established three mechanisms to assist countries across the area to establish lifelong learning projects: the creation of a database of Asian scholars, researchers and practitioners involved with lifelong learning issues and programming across the region; the development and publication of a book of papers on lifelong learning policies, practices and programs across the Asia Pacific region and a lifelong learning conference for APEC members to discuss issues identified in the book [10].

INFLUENCE OF CLASSROOM

Within this very short time, ICT become one of the basic building blocks for modern education system. Many countries now regard understanding of ICT and mastering the basic skills and concepts of ICT as a part of the core education, alongside reading, writing and numeracy [11]. With this changing of technology, both students and teachers are required competency when they are to work effectively in today's society. This approach involves teachers by using ICT application in teaching their specific skilled subject areas and knowledge in order to change their methodology in the classroom. Haddad and Draxler [12] point out that changes are required for schools and education systems more broadly which were originally developed in the context of the industrial age and which now must meet the educational needs of the current global knowledge environment and call for a new schooling paradigm as shown in Table-1 [12].

Table-1: New Schooling Paradigm

From	To
A school Building	A knowledge infrastructure (Schools, labs, radio, television, internet, museums etc.
Classrooms	Individual learners
A teacher (as provider of knowledge)	A teacher (as a tutor and facilitator)
A set of textbooks and some audiovisuals aids	Multimedia materials (print, audio, video, digital etc.)

Sources: Haddad, W.D. & Draxler, A (2002). *Technologies for Education*

There is a need to have view, that where we can see ICT works in practice. Classroom needs to provide all the necessary equipment's and comprehensive ICT service both in primary and secondary schools to develop every teacher competence in using the technology for teaching and learning. This way will change the classroom practice and professional development for teachers. At the same time, it will allow the best management practices, derived from the computerization of school administration and management to spread throughout the schools. One of the most significant design features of classroom will be to access from home to the school network by teachers, pupils and parents [13]. This double-edged sword technology has a great potential to deepen parental involvement in learning to benefit the learners' achievement. The extensive teacher training not only results in teachers learning new skills, but also changes in their classroom practices. Improved access can also address an insistent, and growing, demand for accountability in education.

INFLUENCE OF TEACHER TRAINING

The fast going advancement of technology has becoming great changes within the education context. Today, nearly everyone in the industrialized nations gained access to ICT and the purchase of computers for school use in such nations as the United States has been increasing in such a pace that is difficult to keep track of how many computer machines are now in American schools [14]. Such new technology need to make available with strong desire to equip schools with computer facilities and technologically proficient qualified personal to produce efficient students in the world market of information technology.

Poole [15] has indicated that computer illiteracy is now regarded as the new illiteracy. The role of computer technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in education technology instruction function policy. The concept of educational technology as being crucial to the advancement of teaching and learning function of instruction is interrelated with each other.

Becker [16] reported a comprehensive survey of the instructional uses of computers in United States public and non-public schools. Only few personal and professional experiences to draw such instructional technology in rich effective experiences in technology enhanced classrooms. There is no doubt that computer can aid the instructional process and facilitate students' learning. Many studies have found positive effect associated with technology aided instruction [17, 18].

Worldwide is recognized the need of ICT training into initial teacher and in-service teacher training as a rapid change in the structure and content of training and delivery methods instructions. The use of Information and Communication Technology (ICT) in teacher training education programs is gaining a great momentum and interest throughout the world. UNICEF's Teachers Talking about Learning also illustrates the application of this approach to ICT teacher training.

In the year 2010 DOEACC center, Imphal has conducted training on website design and construction for Government and private higher secondary schools of Manipur for the 1st time sponsored by Department of Science and Technology, Government of Manipur, Imphal, as a result of the training, the teachers:

- Learned application software related and use in web designed.
- Learned how to use new technologies, including how to upload the designed and constructed website on the particular URL database server so that they can upload the latest update data from time to time by themselves.

About 20 teachers including author have completed one month training and gained the knowledge of designing and construction the website. They have designed and constructed their own school website and uploaded to the URL server database. Out of 20 teachers only two (0.2%) lady teacher were participated. It was reported majority of them have effectively gained from the training. Teachers improved their professional ability, broadened their fields of interest designed and construction of website, and were inclined to train themselves to make a well more improvement by self-learning throughout the year.

Today Teacher education in India is being redesigned to include the change take place across the world. The Government of India initiated several programs starting with computer assisted learning and teaching (CALT) in late 1980s [19]. Developing countries like India are using to introduce the ICT as a way of providing teachers with new skills and introducing new pedagogy into the classroom by giving proper training. Realizing the importance of ICT in Education, some teacher-training institute/college of India provides the ICT as a curriculum in B.Ed., program. A two credit compulsory course, namely, Information and Communication technology (ICT) was designed, developed and implemented in the B.Ed. programme offered by the Department of Education (CASE), faculty of Education and Psychology. The findings of the study conducted on the performance and need of the course shows that "the experience of institutionalization of ICT in education as a compulsory core course at the B.Ed. level (2002-2003) in the M. S. University of Baroda has been quite encouraging but challenging [20]. Some of the initiatives in proving teacher training through use technology and ICTs either within the institute or distance or at the practice teaching schools and NCTE initiatives are sited [20]. Such training will get a chance to learn the idea of using new computer and teaching skills, and gain more positive attitude about technology and teaching.

In the state of Manipur, there is no provision to teacher trainee to take ICTs training in B.Ed., and M.Ed., teacher training program like other state of the country. Whereas DOEACC center, Imphal has been conducted ICT training for college teachers only since July 2005 with the initiative of Directorate of Education University and higher education, Government of Manipur, Imphal (India). Teachers mostly develop new technological and pedagogical skills related to ICT in education.

INFLUENCE OF DISTANCE LEARNING

The new changing dimension ICT in education is the role of distance education that is increasingly important as it has a great potential for expanding to educational opportunities. Many developing countries have universities of the hybrid sort [21]. For instance, China has a long history of using satellite television to deliver distance education. In September 1998, the Chinese Government Ministry of Education has launched an experimental pilot of distance college education in some Universities - Beijing Communication, Tsinghua, Zhejiang, and Human universities. Using the technology advantage, many educational organizations have offered the distance education to deliver the distance education program to its vast and remote population. Such distance education course is to help the students who are at workplace at times when conventional classes take place in the classroom. Indeed, the great ability of ICT influence in distance learning is that it makes timely possible to combine work and study, instead of taking a sabbatical or dropping out. Such ability of combined study and work at a time is frequently a reason why students, turn into distance learning program as continuing their education that their jobs cannot afford them to sit in a classroom at a certain time. Many of the distance students say that they would not have been able to take the course on campus and that, the online version give them more flexibility [21].

In the USA, students frequently turn to distance education to prevent the work commitment and traveling to a class from a job or home tasks time [21]. Use of technology in distance education has become increasingly sophisticated while many developing countries use simple technology such as satellite television, others wide variety of techniques for distance instruction. In United States, now the most popular and fastest growing mode for delivering distance education is live video instruction [22].

CONCLUSIONS

ICTs provide a great opportunity for continuous improving in the teaching and learning processes. Many countries have made visions of the future, where ICTs are seen as engines of transformation to achieve a desired state. It is difficult to predict how education has changed over the next decades or the next century, but there will be certainly change in pedagogies, which more readily recognize the ways teaching and learning process with new technologies. Learning outputs the need to reflect this. Looking at the future there is a great hope, ICT will leverage to bring the educational change and innovations will have important impacts on a country's social and economic development.

REFERENCES

1. Blurton, C. (1999). ***New Directions of ICT-Use in Education.*** University of Hong Kong, 1st on-line version of the original contribution to UNESCO's world communication and information (Report).

2. Retrieved from www.ltscotland.org.uk/earlylears/images/benigna_addtion_tcm-122419.pdf

3. Retrieved from www.unesco.org/images/0013/001390/139028e.pdf

4. Hatton, M. J. (Ed.). (1998). Lifelong learning: Policies, practices, and programs. Retrieved from www.apec-hurdit.org/lifelong-learning-book/main.htm

5. Retrieved from ww.worldbank.org/html/cgiar/publications/mtm97/mtm9712.pdf

6. Retrieved from http://www.dfee.gov.uk/dfeehome.htm

7. Retrieved from http://www.lifelonglearning.co.uk

8. Retrieved from http://www.ellinet.org/elli/home.html

9. Retrieved from www.ec.europa.eu/education/policies/lll/life/memen.pdf

10. Retrieved from http://www.apec-hurdit.org/lifelong-learning-project.html

11. Khvilon, Evqueni, & Patru, Mariana. (2002). ***Information Communication Technology in Education: A curriculum for Schools and programs of teacher Development***" *UNESCO* Coordinator and Editor Coordinator, Division of higher Education UNESCO.

12. Haddad, W. D., & Draxler, A. (2002). ***Technologies for Education.*** Paris: UNESCO and the Academy for Educational Development. Retrieved from http://www.portal.unesco.org/ci/en/ev.php-URL_ID=22984&URL_DO=DO_ PRINTPAGE&_SECTION=201.html]

13. John Anderson. ***The changing culture of teaching and learning***. Retrieved from http://demo.openrepository.com/gtcni/bitstream/2428/8061/1/2020+Book+The+Changing+Culture+of+Teaching+and+Learning+John+Anderson. pdf

14. Harper, D. O. (1987). The creation and development of educational computer technology. In R. M. 17. Thomas & V. N. Kobayashi (Eds.), ***Educational technology: its creation, development and cross-cultural transfer,*** *pp.* 35-63. Oxford: Pergamon Press.

15. Poole, G. A. (1996, January 29). ***A new gulf in American education, the digital divide***. New York: Times.

16. Becker, H. (1986, January). ***Computers in the schools. A Recent update***, pp. 96-102. Classroom Computer Learning.

17. Burnett, G. (1994). ***Technology as a tool for urban classrooms.*** *ERIC/CUE Digest, 9*5, New York: Eric Clearing house on Urban Education. Retrieved from http://www.ericdigests.org/1994 /tool.htm

18. Fitzgerald, G., & Werner, J. (1996). The use of the computer to support cognitive behavioral interventions for students with behavioral disorders. ***Journal of Computing in Childhood Education,*** 7, 127-48.

19. Kondapalli, Rama. ***Transformational Value of ICT in Teacher Education: Learning's in India.*** Retrieved from www.wikieducator.org/images/e/.../pid_619.pdf

20. W., J. Pelgrum, & N., Law. (2003). ICT in education around the world: trends, problems and prospects. ***UNESCO: International Institute for Education al Planning***, (Paris).

21. Cairncross, Frances, Poysti, Kaija, Srivastava, Lara. ICTs for education and building human capital. Vision of the information society. Retrieved from www.itu.int/osg/spu/visions/papers/educationpaper.pdf

22. Moore, D. R., & Lockee, B. B. (2002). A taxonomy of bandwidth: considerations and principles to guide practice in the design and delivery of distance education. Unpublished manuscript: Portland State University Quoted in Distance Learning: Promises, Problems and Possibilities. ***Doug Valentine, Online Journal of Distance Learning Administration, Fall.*** Retrieved from http://www.westga.edu/%7Edistance/ojdla/fall53/valentine 53.html

23. Retrieved from http://www.ascilite.org.au/ajet/e-jist/docs/vol8_no1/commentary/assess_ed_tech.htm

24. Retrieved from http://www.proz.com/translator/1463134

25. Retrieved from http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=s02161998c

26. Retrieved from http://www.ifets.info/journals/8_1/13.pdf

27. Retrieved from http://wikieducator.org/images/e/ef/PID_619.pdf

28. Retrieved from http://www.weejournals.iconosites.com/000_vig_user_files/site_uploaded/9096/Vol.%203,%20No.%201,%202...

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SECURING TRANSACTION IN MOBILE COMMERCE USING J2ME AND XML

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ABSTRACT

M-Commerce is emerging as ubiquitous technology among the existing wireless medium. It is technique of making transaction using mobile phones. Users are highly dependable on mobile phone because of its anytime, anywhere features. The transactions using mobile phones are increasing than desktop. Therefore, the performance and adaptability of M-Commerce is highly dependable on security of transaction.

Mobile phones use different protocols for their display and programming while making the transaction. WAP, i-mode and J2ME technologies are used for programming for making transaction. The XML file is used to send data during transaction. The XML processor takes more time to encrypt which leads to breakdown the security during transaction. This paper has defined the code to parse XML file, which reduces it size so that data during transaction would be sent with ease and fast.

To enhance the security, XML file is encrypted before parsing. This paper has the code for encryption and parsing of data during transaction. The code is written in XML and J2ME as these technologies can easily run on multiple platform.

KEYWORDS

Wireless Application Protocol, J2ME, i-mode, XML, Parser etc.

INTRODUCTION

Mobile commerce is a new emerging and ubiquitous technology, which is still in infant stage. It is considered as making a commercial transaction through mobile phone. Mobile phones are more popular than desktop because of its ease of availability, uniqueness, small size and anytime work. Users take advantage of this aesthetic consideration. Mobile phones use Wireless Application Protocol (WAP), i-mode and J2ME as programming protocols to make transaction. The term mobile is derived from six different categories by using first letter in each category. These categories are:

"M: the need of mobility"
O: the need to improve Operation
B: the need to improve Business barriers
I: the need to improve Information quality
L: the need to decrease transaction Lag
E: the need to improve Efficiency"

M-Commerce is defined as E-Business with mobile device within its fundamental concept and architecture [Woo and Jang 2008]. The success of M-Commerce depends on the acceptance of M-Commerce application among targeted customer and business vendor. It also depends on fast, secure and user friendly mobile telecommunication. The mobile telecommunication as a part of wireless network is broadly categorized in five generation. The first generation of mobile communication was analogue. The second generation used digital encoding for voice. The third generation supports multimedia capabilities and circuit switched low speed data services. The fourth and fifth generation is in developing stage. These generations uses different technologies to work with mobile commerce.

GÉNÉRATIONS OF MOBILE COMMUNICATION

Generation of mobile phones vary in technologies and speed which effects their involvement in M-Commerce. First generation has the standards like Total Access Communication System (TACS), The Nordic Telephone (NMT) system, The Japan Digital Cellular Network System (JDC) and the Advanced Mobile Phone System (AMPS). The first generation of mobiles was based on voice oriented analogue mobiles and not suitable for business activities and modern M-Commerce services because of low quality of transmission and exclusive voice orientation [Krishanmurthy and Pahlavan 2002].

The second generation is still worldwide in use and based on the digital multiple access technology, which includes Time Division Multiple Access (TDMA) and the Code Division Multiple Access (CDMA). The other systems of second generation are Global System for Mobile service (GSM), Personal Access Communication System (PACS) and Digital European Cordless Telephone

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(DECT). These systems use digital encoding and support transmission not only for voice but also for other data like fax and SMS. They use encryption techniques to enhance confidentiality of transmitted data.

GSM supports various types of mobile devices independent of device manufacturer. This system has a good compatibility with fixed line network i.e. ISDN (Integrated Service Digital Network). The General Packet Radio Services (GPRS) is the main standard of 2.5 generation, which lies between second and third generation [Schiller 2001]. GPRS is a packet switched technology for non-voice service that allows high-speed transmission of data [Buckingham, 2000a]. In this technology, the data to be sent is broken up into small packets, which are routed by the network between different destinations based on addressing data with-in each packet. The Packet Switched GPRS is used only as a secondary network channel along with circuit switched network. It gives voice transmission a very high priority. If the capacities are being utilized for a voice call, then data transmission needs to take a back seat [Schell, 2002]. It hinders the development of data intensive and time critical mobile application based on GPRS. EDGE is a 2.5G technology that is based on GPRS and can be used to offer personalized multimedia services similar to 3G technologies [Toh, 2002]. It can be used to transmit both voice and data.

The 3G generation provides a broad range of services like interactive multimedia, video telephony and high speed of internet access. The European 3G standard is known as UMTS and based on radio access technology called Wideband Code Division Multiple Access (WCDMA). UMTS is initially available only in metropolitan area so, the devices must be backward compatible with the GSM/GPRS standard. A UMTS subscriber must be able to use normal mobile services while on move outside of big cities. As the 3G services are just beginning to reach users, 4G is launched in year 2010, withstanding announcements by individual firms, e.g. NTT, to pre-pone 4G to year 2006 [Dholakia et al., 2004]. A 4G standard is expected seamless roaming between 2.5G, 3G and WLAN is achieved so that mobile devices will automatically detect the presence of a network with higher bandwidth and switch to it. Countries like Sweden, Norway, Ukraine and USA are moving to 4G.

Infoma (2012) poised that 60% of operators are planning to launch Long Term Evolution (LTE) or 4G based services by 2012. LTE allows the fastest download and upload speed and faster response time to data-intensive services like video. The largest LTE operators in world are Verizone wireless (US), NTT DoCoMo (Japan) and AT&T (US). Most of the smart phones lack support to LTE, therefore LTE is not becoming truly mass-market [Smart Card Expo, 2012]. The proposed features of this system include location sensing, high speed and self-tailoring to user needs. Different countries like France, Switzerland are planning to launch and countries like China and Japan have launched the mobile devices, which are running successfully in their own countries for secure transaction.

The fifth generation is started since 2011 beyond the standard of 4G. This generation is still under the umbrella of fourth generation and still many telecommunication companies use it with standard 3rd Generation Partnership Project (3GPP), Worldwide Interoperability for Microwave Access (WiMax) and International Telecommunication Union-Radio Communication Sector (ITU-R).

The idea behind 5G is lower battery consumption, lower outage probability, high bit rate in coverage area, no traffic fees due to low infrastructure deployment cost. The 5G technology works on a speed of 1.056 GBPS up to 2 kilo meters (tested by Samsung) and support virtual private network.

The following table describes the comparison among all generation

S. No.	**Name of Generation**					
Key Features	**First Generation**	**Second Generation**	**2.5 Generation**	**Third Generation**	**Fourth Generation**	**Fifth Generation**
Speed	Between 28 KBPS and 56 KBPS	Between 22.8 KBPS (GSM), 28.8 KBPS (HSCD)	115.2 KBPS (GPRS) Actual rate is 14 KBPS while sending and between 28 and 64 KBPS while receiving, 384 KBPS (EDGE)	9.6 KBPS to 2048 KBPS as it uses hierarchical cell structure so the range is different in different cell	100 MBPS	1.056 GBPS up to 2 KM
Technology used	Based on voice oriented analogue mobile Technology used are: Total Access Communication, Nordic Mobile Telephone, the Japan Digital	Time Division Multiple Access, The Code Division Multiple Access, Global System for Mobile Service, Personal Access	The Enhanced Data Rate for Global Evolution (EDGE), General Packet Radio Service (GPRS)	Universal Mobile Telecommunication System (UMTS), Wideband Code Division Multiple Access (WCDMA)	Long Term Evolution	Officially no translational 5G development projects have been launched, MBPS still under

	Cellular Network System, The Advanced Mobile Phone System.	Communication System, Digital European Cordless Telephone, High Speed Circuit Switched Data				development and growing under umbrella of 4G
Limitations	Not suitable for voice data	Circuit Switched Technology, more suitable to laptop than mobile	Few services are offered which are not possible due to low transmission rate	High cost of UMTS license so the customer response is very less, moreover need a special device to operate on UMTS.	most of the smart phone lack the support to LTE therefore, LTE is not becoming truly mass market , high bit rate availability in larger portion of cell	

Sources: Authors Compilation

TECHNOLOGIES THAT PROVIDE SECURITY TO TRANSACTION IN M-COMMERCE

Mobile communication uses WLAN and Bluetooth to send the data across network. In 2004, Mysore became India's first and world's second Wifi enabled city when the company WiFiyNet has set up hotspots covering the complete city [The Telegraph, 2006]. However, there are currently no mobile telephones available, which can communicate via WLAN. The biggest handicap of WLAN is that the handover of a network connection between two Access Points is not possible. On the other hand, it seems likely that WLAN could develop into a complementary standard to UMTS, so that subscribers can use WLAN for data-intensive mobile applications that are needed while outside, but not necessarily while physically on the move.

Bluetooth is wireless technology, which simplifies the communication amongst and between mobile devices and personal computers [GSM Bluetooth, 2005]. The primary reason for its success is to create ad-hoc network and facilitates both data and voice communication. It helps to synchronize data from different devices and can communicate with any other device having Bluetooth. A Bluetooth device can change its broadcasting frequency (frequency hopping) up to 1,600 times per second to provide better security while transmitting data [Tiwari, 2006]. These technologies cannot be used beyond a certain limit to make transaction. To make the transaction worldwide M-Commerce uses J2ME, i-mode, SIM Toolkit and WAP. These technologies may vary to different devices.

Wireless Application Protocol (WAP) is an open global standard that came into existence in 1998. WAP applications are written in Wireless Markup Language that resembles to HTML in its structure. The major functional area of WAP includes Wireless Transport Layer Security (WTLS), Wireless Identity Module (WIM), WAP Public Key Infrastructure, WML (Wireless Markup Language) Script Sign Text and End-to-End Transport Layer Security. A WAP gateway acts as interpreter between the mobile device and a web server, which decodes and encodes the information in such a way so that server and the mobile device can communicate with each other [Lee etal.2004]. The transaction in wireless communication is interrupted and reinstated without proper authentication procedure, which is strictly followed by wired network. The reason is that WTSL does not follow rigorous authentication procedure and do not perform standard check after the establishment of connection. It helps the attacker to redirect transaction request without the knowledge of user. Most websites are not configured to deal with intermittent service failure, which becomes an advantage to attacker.

The Subscriber Identity Module (SIM) is used to store the personal data and can be implemented in the form of SIM card or smart card. This application tool creates the SMS based mobile transaction between mobile client and payment server. The SMS is used to initiate and authorize payment and GSM authentication service identifies and authenticates the user. This toolkit application provides all security features except denial of service and non-repudiation, which is one of hindering factor for adoption of this application. Another limitation of this application is usage of mobile pin code, which can be easily stolen or broken. It covers issues related to transport layer security such as peer authentication, message integrity, and replay detection, proof of receipt and message confidentiality.

The Japanese network carrier NTT DoCoMo (NTT) introduced i-mode in 1999 as an open standard based on programming language iHTML. It is based on packet switched network technology, GPRS, and UMTS compatible.

J2ME is very common in most of the mobile devices because of its easy adaptability and extensibility. The main challenge with J2ME is to run the code safely on mobile devices, which have limited amount of memory and processing power. The mobile devices and application developers are confronted with the problem of choosing which platform to support, while always trying to

keep portability as high as possible. J2ME is designed for mobile devices. The above discussion shows that the technology is now ripe for fully functional, content-rich and value-added M-Commerce applications. The relevant issue is of finding suitable applications and offering them for affordable prices. It also dwells on the modalities of payment mechanisms for different applications. The most important concern of M-Commerce is its security issue and how to make the customer feel secure and comfortable while making any transaction through mobiles. The security issue has touched the every area of M-Commerce from technical security to non-technical security.

NEED OF PARSING XML FILE

The security of M-Commerce should be strong enough to protect different transaction from abuses and to the user's trust. XML based services have two challenges i.e. security and performance. XML based security threats are emerging and consists of mainly data compromise, XML based DoS (Denial of Service) and Content based attack.

The computer hardware can understand only one language. When the code is written in XML, hardware has no clue what it means. Parsers as software convert the code into hardware recognizable form. It is the process of analyzing XML document and generates the internal and structured data representation to be accessed by application program. The main aim of parser is to transform XML into a readable form.

XML processing function includes XML parsing with schema validation. It parses the XML message and checks for its validation. The result of XML parsing should provide enough support for XML query, XML security. It transforms the text into a data structure such as semantic checking, code generation.

XML signature and encryption are widely used and building block technologies, which are easy, and a natural way to handle security in data interchange application [XML Encryption, 2002, 2003]. XML security system consists of XML parsing with schema validation, XML signature and XML encryption. If XML is used at server side then it is consider as a data exchange format. Sending the data from client to server has many advantages such as self-describing data and loosely coupling between the client and server.

ENCRYPTION OF TRANSACTIONAL DATA

Encryption of XML document is important to provide end-to-end security to application, which requires exchange of structured data. It is a two-step process – the first is to seal the document and second is for a secret key used to encrypt the document. In the first step, a secret key is generated using pseudorandom number generator. The XML document is encoded and compressed in form of bytes to reduce the size of cipher text and prohibited the hacker from getting any information related to plain text. In the second step, the secret key is encrypted using a special recipient public key. XML encryption is easy and natural way to handle security in data interchange application. The applications transform the data in XML format by using an XML parser, which increases the possibility to inject data to cause adverse effect in parser.

The attacker generally attacks the application that does not perform sufficient validation to ensure that user controllable data is safer to parser. If continuously bad data is passed to parser, it may crash the parser. Therefore, before parsing it is required to validate and sanitize the user controllable data to ensure that the data is safe for parsing. The encryption is required to protect the data and to prevent non-authorized attempts from accessing sensitive data stored on mobile device. This paper uses the data symmetric encryption where same key is used for encryption and decryption. The following is proposed algorithm for coding:

- Step 1: Create a byte array from the initial password and the initial key.
- Step 2: Create a new Secret key from the key byte array, using AES algorithm.
- Step 3: Create a new cipher for AES transformation and initialize it in encryption mode, with the specified key using API method.
- Step 4: Make the encryption with API method, which results into a new byte array with encrypted password.
- Step 5: Use the same key to initialize the cipher in decryption mode.
- Step 6: Make the decryption of the Encrypted byte array, which results into a Decrypted byte array.

The encryption process takes place with algorithm, complex mathematical functions that are applied to the message and make it unreadable without the decryption key. This algorithm is based on UTF-8, which is variable with encoding and dominant character encoding for WWW. It is compatible with XML, DHTML and XML.

XML Parsing

The mobile devices use internet connection to make transaction. The most efficient way to transfer data between different platform and technologies is to use XML file. XML parser is required to process and extract XML file. A node is required to process XML file. It can be done through following coding:

```
public XMLNode(int nodetype)
{
this.nodetype=nodetype;
this.children=new.vector();
this.attribute=new Hashtable();
}
```

This node is parent text node which is used to get data by using getAttributeNames() function. The data received is put into file by using attribute.put(). The child node can be generated using aforesaid coding which is required to enter the data. The string data type is used to get the data. Once the data is entered, the next step is to parse the XML file. A generic parser class is defined using Kxml parser.

```
public class GenericXMLParser
{
public XMLNode parseXML(KXmlParser parser, Boolean ignore whitespaces) throws Exception
{
Parse.next();
return_parse(parser,ignoreWhitespaces);
}
```

This code help to parse any XML file. The code is tested successfully in lab of Telecommunication Company to see the result, which shows that code can parse the file. This code uses kXML parser, which is a pull parser to avoid fragility caused by SAX parser. The code takes very less time to execute and allow the safe transmission. The hacker has very less to make any changes in transaction. Parsing makes the small packets of file to fasten the processing of the file. This code of parsing has different effect on different operating system.

As explained earlier operating systems effect the transmission of data through mobile devices. This code is very helpful in working with android operating system as DOM and SAX parsers both can work easily on android operating system. Eclipse is used as IDE (Integrated Development Environment) and Java Development kit and Apache Ant are used as command line tool to create, build and debug applications and to control attached devices. These devices should be android devices.

CONCLUSION

XML file is use to transfer the data through mobile device because of its many features. The parsing of XML file reduces the size of file. The parsing can be done through algorithm and programming interface. The proposed algorithm defines the coding, which overcomes the problem of encryption of the key that is stored as string in database. It is required to store the encrypted code not the key.

The proposed coding of parsing reduces the size of XML file to transact the data fast and increase the security of transaction. The different operating systems used in mobile phones have different impact on parsing the files. They affect the performance of parser. The further research can be made on parsing techniques with respect to operating systems of mobile device. As the new technology is developing, the devices are coming with new and advance operating systems, so this study is not limited.

REFERENCES

1. Rami, Alnaqeib, Fahad, Alshammari H., Zaidan, A. A., Zaidan, B. B., & Zubaida, Hazza M. (2010, June). ***An overview: Extensible Markup Language Technology, Journal of computing,*** 2(6).

2. Cheng, s. (2006). ***Squeezing the last byte and last ounce of performance on your MIDLETS***. doi: http://developers.sun.com/learning/javaoneonline/2006/mobility/TS-3418.pdf

3. Collado, Esther Minguez, Soto, M. Angeles Cavia, Garcia, Jose A. Perrez, Delamer, Ivan M. Lastra Jose L. Martinez. (2008). Embedded XML DOM Parser: An approach for XML Data Processing on Networked Embedded systems with Real-time EURASIP. ***Journal on Embedded systems,*** 20.article id 163864.

4. (2004). ***Document Object model Core.*** doi: http://www.w3.org/TR/DOM-Level-3Core/core.html.

5. Ghosh, Soma. (2003). ***Add XML parsing to your J2ME application-combine mobile data and mobile code on your mobile device***. IBM developer works.

6. Green, P. (2004). ***Eastern Europe's Foray into M-commerce,*** pp. 3.8**.** The New York Times.

7. Hanslo, S. Wayne, MacGregor, Ken J. (2003). ***Using XML messaging for wireless Middleware Communication.*** University of Capetown.

8. Hope-Rose, D. (2001). ***Successful E-Business Deployment: Beyond Software.*** Gartner: (No.COM-14-5080). Retrieved from http://micsymposium.org/mics_2006/papers/HuKaoYangYeh.pdf.

9. (2009, October). ***Mobile OS and efforts towards open standards.*** Infoway Dotcom.

10. Kannan PK, Chang, A., & Whinstone, A. B. (2001). Wireless Commerce: Marketing Issues and Possibilities. Sprague RH Jr (Ed.). ***In Proceedings of 34th Hawaii International Conference on System sciences*.** New Jersey: Piscataway. IEEE.

11. Lee. A. (2000). ***Small firms must take Internet plunge or risk being sidelined***. The Engineer.

12. Lee, Young Joo, Moon, Young KI, & Sohn, Won Sung. (2004). ***Secure Mobile Commerce based on XML Security.***

13. Liu, Wenjun. (2010). ***Design and Implement Large Mobile-Commerce system Based on WEB Services.*** College of Management, South-Central University for Nationalities, Wuhan, China.

14. Lu J., Zhu X., Peng D., Huo H. (2011). Active XML for Service Discovery in Mobile Environment. ***JCIT*** 6(6), 47-53.

15. Nag, B. (2004). ***Acceleration Techniques for XML Processors.*** In Proc. of XML.

16. Scniller, J. (2000). ***Mobile Communications.*** New York: Addison-Wesley.

17. Singh, Ajeet, Singh, Karan, Shahazad, Azath, Azath, M., Kumar, Satish. (2012, May). Secure payment information using XML technology***. International Journal of Advanced Research in computer Science and Software Engineering,*** 2 (5).

18. Stuart, D., & Bawany, K. (2001).***Wireless Service: United Kingdom (operational Management Report***) No.DPRO-90741: Gartner.

19. Toh, C. K. (2002). ***The Wireless Network Evolution***. Excerpted from: AdHoc Mobile Wireless Networks: Protocols and Systems. Upper Saddle River. NJ 2001. Sample chapter. doi: http://informit.com/articles/printerfriendly.asp?p=6330

20. Tiwari, R., Buse, S., & Herstatt, C. (2008). Mobile services on Banking Sector: The Role on Innovative Business in Generating Competitive Advantages. ***In Proceeding of International Research Conference on Quality, Innovation and knowledge Management,(pp. 886-894).*** New Delhi.

21. Wei Zhang, Robert A. van Engelem. (2006).TDX: a High-Performance Table Driven XML Parser. ***In Proceedings of the 44th ACM Southeast Conference*** *(ACM SE'06*), pp. 726-731.

22. Woo, Jongwook, Jang, Minseok. (2008). The Comparison of WML, cHTML and XHTML-MP in M-commerce***. Journal of Software,*** 3(7).

23. Retrieved from http://www.slideshare.net/ijcsa/parsing-of-xml-file-to-make-secure-transaction-in-mobile-commerce

24. Retrieved from http://www.it.iitb.ac.in/~annanda/micro-payment/selected-papers/IRI-2004-MPaymentSecurity.pdf

25. Retrieved from http://www.streetdirectory.com/travel_guide/117204/.html

26. Retrieved from http://www.slideshare.net/pankajbwc/mobile-computing-24088881

27. Retrieved from http://www.streetdirectory.com/travel_guide/117204/technology/overview_of_mobile_framework.html

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EDUCATION IN INDIA

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ABSTRACT

Education in India has many facets, many of which have been forged by different institutions that existed from historic times to the present day. Talking about history, the education system that existed in old India was unique and some of its components and underlying principles are still found in places in the country. Contemporary education is more or less fashioned as per Western education models and systems. There are two things unique about education in India – the diversity represented in the content that further contains different elements like traditions, culture, language, dialect, etc. The second thing unique about education in India is a popularly inherited system that has evolved over the years in to a unique entity.

"Education is simply the soul of a society as it passes from one generation to another." G. K. Chesterton

EDUCATION IN INDIA: PAST

A well-established education system existed in India even in ancient times. There were old brahminical schools were theology, philosophy, arts, military education, public administration, etc., was taught to the students. One major drawback about these schools was that education in India was a privilege and only children belonging to higher castes were allowed to receive the education. Ancient schools of India were mostly residential schools. The teacher and the pupils that used to receive education stayed together until the education was completed. Education in India at that time was free; however, students returned the favours by helping the teacher in daily chores. The teacher or Guru was the central figure and revered by all. In contemporary times, the great respect teachers and schools enjoy are somewhat related to the great honour bestowed in ancient times. There were no books and recorded medium of passing over the knowledge. Whatever was taught was taught verbally and knowledge passed from the teacher to students and so on.

EDUCATION IN MEDIEVAL INDIA

In medieval India, new elements were fused in the education as foreign invaders brought with them their culture, their teachings and their lifestyle lifestyle. The growing influence of Islam also led to the establishment of schools for Muslims. Again, the education primarily focussed on theology. Thus two types of schools – the Vedic schools and Madrasas, were dominantly present in the pre-colonial India.

EDUCATION IN INDIA: COLONIAL PERIOD

In the pre-colonial and early colonial period, India was not a strong nation in principle. The region comprised of separate small states that were often engaged in territorial disputes. Meanwhile, the renaissance period and great developments in the 14th, 15th and 16th century in Europe led them to explore new lands and further their movements. It was the time when missionaries stared arriving in Asia and later in India. After the occupation of Indian states, the British, who had occupied a large part of India, felt the need to directly communicate with appointed officials. The interpreter or messenger system characteristic of the pre-existing monarchs ended, and British officials made English language necessary for Indian officials; which was intended to help them in administration. From time-to-time in the colonial period, stress was laid on English schools; oriental education, which were to include content as was made required in Western schools. The first English schools were seen as conspiracy measures to weaken the traditions and popular culture of Indian states. However, few reformers cashed on the opportunity and imbibed some essential traits, which later on changed the entire structure of Indian education system.

MODERN EDUCATION: FROM THEOLOGY TO SCIENCES

In the postcolonial period, the knowledge and great achievements by European states shifted the focus of education on sciences and popular studies that were being taught and learned in European countries. British left India in 1947, but the education system remained, though some reforms were incorporated in it. The popular school system, formal education, progressive learning, higher studies and even the content was inherited. In the post Independence period, the government, renowned educationists, social scientists and many leaders stressed on making the education India centric, with focus once again on the popular culture and

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traditions. Now there were slight difference, as both Western and our indigenous models were mixed up to shape into an altogether different entity. Thus, influences and institutions in various periods, throughout the history, shaped education in India.

MODERN EDUCATION SYSTEM: THE PRO'S AND CON'S

Education is the imparting and acquiring of knowledge through teaching and learning, especially at a school or similar institution. The earliest educational processes involved sharing information about gathering food and providing shelter; making weapons and other tools; learning language; and acquiring the values, behaviour, and religious rites or practices of a given culture. Before the invention of reading and writing, people lived in an environment in which they struggled to survive against natural forces, animals, and other humans. To survive, preliterate people developed skills that grew into cultural and educational patterns.

Education developed from the human struggle for survival and enlightenment. It may be formal or informal. Informal education refers to the general social process by which human beings acquire the knowledge and skills needed to function in their culture. Formal education refers to the process by which teachers instruct students in courses of study within institutions. Talking of the modern day education, one feels proud; of saying yes, I am an educated person. Formally or informally, all of us are educated. Education is the equipping with knowledge. The overall development of mind, body and soul is the real education.

Carter G. Woodson once said, "For me, education means to inspire people to live more abundantly, to learn to begin with life as they find it and make it better."

THE PRO'S

Modern day education is aided with a variety of technology, computers, projectors, internet, and many more. Diverse knowledge is being spread among the people. Everything that can be simplified has been made simpler. Science has explored every aspect of life. There is much to learn and more to assimilate. Internet provides abysmal knowledge. There is no end to it. One can learn everything he wishes too. Every topic has developed into a subject. New inventions and discoveries have revealed the unknown world to us more variedly. Once a new aspect is discovered, hundreds of heads start babbling over it, and you get a dogma from hearsay. Not only our planet but also the whole universe has become accessible.

Now we have good and learned teachers to impart us with knowledge of what they know. Everyone is a master in his field. Professionals of their field are teaching our children and us. Presently our education is based on making us the best in our area of interest, to help us reach our goals more easily. We are grasping more of the fact-based knowledge. What we learn helps us in our career and in our profession. Professionalism is deep-rooted in our society now and this education makes us so.

Skill-development and vocational education has added a new feather to the modern system of education. There is something to learn for everyone. Even an infant these days goes to a kindergarten. In addition, a little grown, mentally and physically is promoted to a Montessori. Everything is being categorized, be it a primary, middle, a higher secondary or graduate school. We have temples of education known by a familiar word the "university".

Whatsoever we are getting educated day by day and what is good about is that it is a never-ending process.

Rightly said by Aristotle, "Education is an ornament in prosperity and a refugee in adversity." is what everybody feels now.

THE CON'S

Well, that was the positive side, but every story has two telling. Of all the virtue, our education system has developed into mere schooling now. New trends are being developed which are far more a baloney that boon.

Albert Einstein once said, "Education is that which remains, if one has forgotten everything one learned in school."

Firstly, our education is confined to schools and colleges. It has become a process of spoon-feeding. "Spoon feeding in the long run teaches us nothing but the shape of the spoon" were the words of E. M. Forster. We are being fed with facts and knowledge. Not art, not books, but life itself is the true basis of teaching and learning. Cramming of facts and dates, hi-fi mathematical formulas, theories and doctrines should be at college levels when one has chosen his area of interest. What will the history pay a doctor or a mathematician, or medical terms to a historian?

Secondly, an art can only be learned from a workshop of those who are earning their bread from it. Modern education has spread more ignorance than knowledge. Most of the women even do not know, where, the fabric they are wearing, came from. The word "How" is missing in our world which causes ignorance.

"Education…has produced a vast population able to read but unable to distinguish what is worth reading," says G. M. Trevelyan.

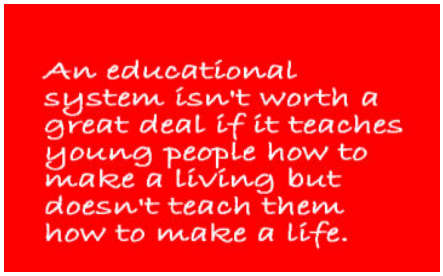
Thirdly, all education is bad which not self-education is. Presently, children after school are sent to tuitions. This is a clear question mark on the ability of school-teacher. Homework tutorials are mushrooming up in our society. Students are thought of as they can't do anything on their own and so are sent even to do the homework. Our schoolings got many loop-holes. They guide us through a well-catered pathway, which finally leads to professionalism. Homework is a waste of time, if it is to repeat class work done today or to be repeated as class work to be done tomorrow.

Our schooling does not leave us with time to get educated. Mark Twain once said, "I have never let my schooling interfere with my education". Our child's normal routine has become to wake up early, brush up their minds with light reading, go to school, then go to tuition and finally come home and do the homework.

Finally, our education is producing machines out of pupil. They read books, they speak books and they do books. Discussing in class lead to complications, which remains as confusions for a lifetime if left untreated. Vladimir Nabokov, a U.S critic, poet and novelist says "Discussion in class, which means letting twenty young blockheads and two cocky neurotics discuss something that neither their teacher nor they know." Therefore, it is a matter of debate that our education system is fallacious or fair.

CONCLUSION

Education in India today is nothing like it was in Pre-Independence and Post-Independence Era. Education System in India today went through many changes before it emerged in its present form. Present education system in India is also guided by different objectives and goals as compared to earlier time.



Present system of education in India, however is based around the policies of yesteryears. After independence, it was on 29th August 1947, that a Department of Education under the Ministry of Human Resource Development was set up. At that time, the mission was the quantitative spread of education facilities. After, 1960's the efforts were more focussed to provide qualitative education facilities.

The National Policy on Education was formulated in 1968. It was formulated to promote education amongst India's people. During 1987-88, it was Operation Blackboard which aimed to improve primary education by providing at least 2 rooms, 2 teachers and essential teaching aids like blackboard, chalk, duster etc. In 1994, District Primary Education Program (DPEP) was launched. It focussed on universalization of primary education, which made primary education accessible to each child of school going age; once a child was enrolled in school he/ she were to be retained.

REFERENCES

1. http://www.studentvisaexpert.com/2012/06/an-overview-on-indian-education-system-today/
2. https://en.wikipedia.org/wiki/Education_in_India
3. Gaudino, Robert L. *The Indian University.* Bombay: Popular Prakashan, 1965.
4. Government of India. *Department of Education.* Available from http://www.education.nic.in/.
5. "Home away from home: Elite residential schools." *India Tribune 42* (17 March 2001): 24-25.
6. Joshi, Murli M. "Higher Education in India: Vision and Action." Paper presented at the UNESCO World Conference on Higher Education in the Twenty-First Century, Paris, and October 1998. Available from http://www.education.nic.in/htmlweb/unhighedu.htm/.
7. Mohan, Brij. *Democracies of Unfreedom: The U.S. and India.* Westport, CT: Praeger, 1996.
   ——. "The metaphysics of oppression: Human diversity and social hope." Paper delivered to the Second Diversity Conference, University of South Carolina, and November 2000.
8. Sharma, Neerja. *Evaluating Children in Primary Education.* New Delhi: Discovery Publishing House, 1997.
9. Tiwari, Satish, ed. "Education: Development and Planning." In *Encyclopedia of Indian Government Series.* New Delhi: Anmol Publications, 2000.

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