

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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**OPERATIONAL EFFECTIVENESS OF VIRTUAL PANEL IN POWER PLANT SIMULATOR: A STUDY**

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**ABSTRACT**

*The emergence of low cost virtual panel simulators has shown positive signs and growth perspectives against the conventional full scope replica fossil fuel simulators. The need of the man-hour and the cutting edge technology force the virtual panel/ reality applications inevitable even in the real time simulators especially for sub critical and supercritical boiler based power plants. The impact of these technologies is studied with a group of trainees trained in both virtual panel and replica simulator. Further the paper discusses on the case study where in the operational conveniences with parameters of effectiveness, comfort and age factor are compared for the virtual panel and generic conventional simulator.*

**KEYWORDS**

Plant-loading factor (PLF), Real Time Simulations, Virtual panels.

**1. INTRODUCTION**

Training the manpower for the enhanced capacity in the coming years cannot be imagined without replica power plant simulators. Especially in the new projects having high capacity power generation the simulator training emphasizes the reflections and skills to improve the plant-loading factor (PLF) of the power stations on the national grid. With the kind of mal-functions that can be emulated within 2-3 weeks on a full-fledged training, the trained personnel can appreciate the skill improvement that could have otherwise come in their lifetime service. A typical simulator has the following salient features for training/ research purpose.

**A. SIMULATORS**

All simulators have the following four components:

- An internal model of the world, or part of it; for example, a model of a vehicle traveling through a model geography, or a model of the physical state of a typical power plant.
- External devices to display the state of the model; for example, one or more video displays, audio speakers, or a simulated instrument panel.
- External devices to supply control inputs; for example, a steering wheel, a joystick, or simulated knobs and dials.
- An operator (or hardware under test) that "closes the loop" by moving the controls in response to what is shown on the display.

**B. FEATURES OF A TRAINING SIMULATOR**

The important features of Instructor Station essentially required for providing training to the operators / Engineer Trainees are

- Freeze / Run of process
- Various initial conditions for different loads can be stored and called at will
- Summaries in respect of important monitored Parameters and also in trend displays can be viewed.
- Slow and Fast time simulation.
- Insertion of external parameters like Grid voltage, Grid frequency etc.
- Override facility, Where the operator can override the I/O Points
- Complete simulation diagrams can be viewed in dynamic mode. These are the plant system Monitoring & control schemes.
- Training exercises can be generated for evaluating the performance of the trainee
- Backtrack to the specified condition of the simulation load

**2. TYPES OF PROCESS CONTROL IN SIMULATOR**

Though the simulators have been a mere replica of the power plant control room and its process, in the course of time the simulators and the basic control had witnessed a wide changes i.e. centralized control, Distributed control and Distributed control with Intelligent Instrumentation. The latest technology prefers Intelligent Instrumentation with an industrial computer like CA8000 (vertical/ horizontal mount) whose motherboard along with memory costs around 1500\$ against a typical controller. Conventional operating system can be loaded to increase the user interactivity. The 210 MW fossil fuel replica Simulator is having three I/O nodes being supported by such a reliable system.

**3. VIRTUAL PANELS AND ITS APPLICATIONS IN POWER PLAN SIMULATOR**

Virtual Panels are a major add-on package option that simplifies access to monitored and simulated data by constructing realistic looking front panels from an extensive library of gadgets. You can use these panels to control a real piece of equipment, as well as simulate or create virtual equipment that can

communicate on a live bus. Virtual Panels can also be useful in emulating and testing a proposed front panel design, in order to simplify the user interface for data control and monitoring[2].

**A. VIRTUAL PANEL SOFTWARES**

AMPOL provides high-performance, feature rich, advanced software tools– dataMARS and dataSIMS – that enable realtime systems developers, integrators, troubleshooters and airline field engineers to streamline their work effort.

**B. VIRTUAL PANEL CONTROLS**

The excellent reliability and data logging features of intelligent instrumentation have given the clear edge for the virtual panel controls where in the control can be controlled by some basic movement on the keyboard/ mouse / joystick. The other features of the virtual panel control have made it to be a better alternative. Having 14 monitor’s screen it is possible to have the simulation of 210MW simulator. The control can be through conventional UCB display, scheme display or even through a mnemonic keying on the command line

**C. FEATURES OF VIRTUAL PANEL CONTROLS**

- No physical movement / moving parts
- Lesser Maintenance ,Easy upgrade
- Paper/ink free and hence environment friendly
- High fidelity (to swap/ interchange)
- No transport delay and hence faster
- Cost / meter is lesser
- No need for I-O interfacing
- Faster and reliable
- No need for skilled instrument mechanic

**4. FUTURE PROSPECTS FOR DISTRIBUTED INTERACTIVE AND REAL TIME SIMULATIONS USING VIRTUAL PANELS**

A distributed interactive system increases the reliability of the operating life of the full scope Panels simulator by increasing the mean time between the repair (MTBR) and mean time between the failures (MTBF) [5].

**D. Virtual Reality Simulators**

A virtual reality simulator aims to give its operator a sense of presence in a computer-generated world. Usually the operator can see only the simulated display, and has no other visual referents. Because of this, the frame rate must be high enough to give smooth, no flickering animation, and any perceptible transport delay can cause nausea and disorientation. However, the virtual world is not required (or expected) to look like the real world, so the simulator may be able to do less work to prepare the display. A virtual reality application training modules have already been developed for critical operations like substation maintenance[1,4], nuclear reactor maintenance.

**5. CASE STUDY**

A case study was initiated on the trainees of 210 Mw fossil fuel simulator from January 2006 at National Power Training Institute (NR). The study was concentrated on select batches for Generic conventional coal fired simulator and the same persons were offered training for the same exercises on the virtual panel one-to-one simulator based on [3]. Some exercises like 50% load condition and full load initial conditions were taken as bench marking. The number of trips for a particular time slot (6-hrs) was studied in both the cases and the tabulation has been formed. Also some of the observed points are listed in Table.I.

**TABLE I:COMPARISON ON THE OBSERVATION ON THE TRAINEES PERFORMANCE (using Trainee session log)**

No	Working condition in a 210 MW Power Plant	Number of operations (Key Changes)		Number of Trips		Age group of the trainees with tripping of plant operation on virtual panel	
		Generic conventional Simulator	Virtual Panel Simulator	Generic conventional Simulator	Virtual Panel Simulator	Age>45	Age<=45
1	50% or Half load condition	30	40	3	6	10	5
2	100% load condition	50	55	5	7	6	5

In addition to the above the following points were observed.

- Operating level was often difficult.
- Lack of confidence / computer operating skill.
- Stress on eye / body was more.
- Younger age group (i.e) less than 45 years old had lesser trips in the operation comparing to the old age group
- Demand for bigger visualization was suggested.

**6. CONCLUSIONS**

With the change in technology, the modern power plants undergo a phase change with scheme-based control and the reduction in high speed processing gives an opportunity to go for virtual panel operations. The reduction in manpower per Mega Watt for power plant needs high skilled trained personals and supervisors monitoring super thermal power plants from a single control room. Such a demand in training can be fulfilled with low cast / high fidelity simulators based on the virtual panel simulator which may be a cheaper option for training and research institutions also.

**7. REFERENCES**

1. SRV: A Virtual Reality Application to Electrical Substations Operation Training, DOIBookmark:http://doi.ieeecomputersociety.org/10.1109 /MMCS.1999. 779309
2. Etter, D. 2001. Future of Modeling and Simulation, Presentation to the Executive Council on Modeling and Simulation (EXCIMS). Washington, DC: Deputy Un-dersecretary of Defense for Science and Technology.
3. Weisband S, Atwater L. Evaluating self et al in electronic and face-to-face groups. *J Appl Psychology* 1999; 84: 632–639.
4. Eder Arroyo, Jose Luis Los Arcos, SRV: A Virtual Reality Application to Electrical Substations Operation Training *icmcs*, p. 9835, 1999 IEEE International Conference on Multimedia Computing and Systems (ICMCS'99) - Volume 1, 1999
5. Reliability enhancement through Renovation of the 210MW Simulator, AV Chaoji, Dr. S. Selvam, Proceedings of the International Conference on Reliability and Safety Engineering, INCREASE-2005, IIT Kharakpur Extension, Bhubaneswar, India December 21-23,2005

## A STUDY ON IMPLEMENTATION OF SIX SIGMA

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**PUNE**

### ABSTRACT

*In today's global era of business and information systems, quality plays an important role. In order to get quality product organization has to implement the system so as to get the quality product. Today's competitive environment leaves no room for occurrences of error. Major enemy of quality is occurrence of variation in product through manufacturing process. More the variation more the generation of defects and hence less will be the profit. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. It uses a set of quality management methods including statistical methods and creates a special infrastructure of employees within the organization. Implementation of six sigma will help the organization in minimizing defects, variation increase in profitability of the organization, customer satisfaction.*

### KEYWORDS

Information system, manufacturing process, six sigma, quality management.

### INTRODUCTION

 Six Sigma is a set of techniques and tools for process improvement. It was developed by Motorola in 1986. The world sigma is statistical term that measures how far a given process deviates from standard. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. It uses a set of quality management methods including statistical methods and creates a special infrastructure of employees within the organization. These employees may be six sigma certificate holders of Champions, Black Belts, Green Belts, and Yellow Belts etc. who are experts in the methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets. This is for example, reduction of process cycle time, reduction of pollution, reduction of costs, increase of customer satisfaction and increase in profits.

The term Six Sigma originated from terminology associated with manufacturing specifically terms associated with statistical modeling of manufacturing processes. The maturity of a manufacturing process can be described by a sigma rating indicating its yield or the percentage of defect-free products it creates. A six sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects (3.4 defective parts/million). Motorola set a goal of "six sigma" for all of its manufacturing operations and this goal became a by word for the management and engineering practices used to achieve it. The term six sigma process comes from the notion that if one has six standard deviations between the process mean and the nearest specification limit.

 The often-used Six Sigma symbol

Sigma Level	Yield %	Defects per Million Opportunities
1	30.9	6,90,000
2	69.2	3,08,537
3	93.3	66,807
4	99.4	6,210
5	99.98	233
6	99.9997	3.4

### IMPLEMENTATION ROLES

One of the key innovations of Six Sigma involves the absolute professionalizing of quality management functions which is major factor of any organization. Six Sigma programs adopt a kind of elite ranking terminology to define a hierarchy that kicks across all business functions and levels. Six Sigma identifies several key roles for its successful implementation.

Executive Leadership includes the CEO / Director and other members of top management. They are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements. They also makes the team for implementation of six sigma including experts.

### METHODOLOGY OF SIX SIGMA

Six sigma methodologies are considering the following parameters.

- Customer:** Customer is king of any business process however the goal of six sigma is customer satisfaction. Delighting customers is a necessity.
- Metrics:** Understanding customer requirements and design of specific metrics are main concern to the six sigma. An incorrect metric would lead to wastage of efforts.
- Processes:** With customer requirements and metrics in view the processes leading customer satisfaction have to be improved. Identifying the areas where process needs improvement.
- Employees:** The employees in the organization have to trained about the processes and final goal aligned with the organization's objectives. Employees creates results and involving them is essential to organization's quality approach.

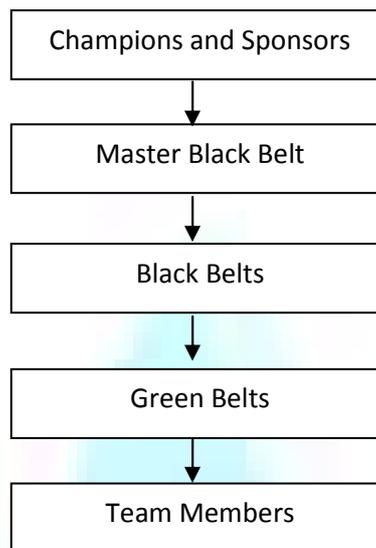
### KEY CONCEPTS OF SIX SIGMA

Some of key concepts of six sigma are as per following:

<b>Critical to Quality</b>	Attributes most important to the customer
<b>Defect</b>	Failing to deliver what the customer wants. Defects are randomly distributed throughout the process.
<b>Process Capability</b>	What the organizational process can deliver
<b>Variation</b>	What the customer sees and feels. Variability is necessarily inherent in any type of process.
<b>Stable Operations</b>	Ensuring consistent, predictable processes to improve
<b>Design for Six Sigma</b>	Designing to meet customer needs and process capability

**SIX SIGMA ORGANIZATIONS**

The deployment of employees in the organization to implement six sigma is critical. The six sigma has five level of hierarchy. At the top are the champions and sponsors the management support and requisite leadership. The ground level is divided into teams led by Green Belts. In the hierarchy Black Belts assists Green Belts and Master Black Belts come to the help of the Black belt.



**Black Belt** – These are leaders of team responsible for measuring, analyzing, improving and controlling key processes that influence customer satisfaction and/or productivity growth. Black Belts are full-time positions.

**Green Belt** – These are similar to Black Belt but not a full-time position.

**Master Black Belt** – These are first and foremost teachers. They also review and mentor Black Belts. Selection criteria for Master Black Belts are quantitative skills and the ability to teach and mentor. Master Black Belts are full-time positions.

**QUALITY TOOLS**

**Cause and Effect Diagram:** Cause and effect diagrams are created by Kaoru Ishikawa (1968) that shows the causes of a specific event. This diagram also called Ishikawa diagram. Common uses of the Ishikawa diagram are product design and quality defect prevention to identify potential factors causing an overall effect. Each cause or reason for imperfection is a source of variation. Causes are usually grouped into major categories to identify these sources of variation.

**Control Charts:** Control charts monitors variance in a process over time and alert the process to unexpected variance which may cause defects. Control charts also known as Shewhart charts in statistical process control are tools used to determine in a state of statistical control.

**Check Sheet:** The check sheet is a form used to collect data in real time at the place where the data is generated. The data it captures can be quantitative or qualitative. Its purpose is to provide a structured way to collect data about quality as a rough means for assessing a process or as input to other analysis.

**Histogram:** In statistics a histogram is a graphical representation of the distribution of data. It is an estimate of the probability distribution of a continuous variable and was first introduced by Karl Pearson. A histogram may also be normalized displaying relative frequencies. The intervals must be adjacent and often are chosen to be of the same size. The rectangles of a histogram are drawn so that they touch each other to indicate that the original variable is continuous.

**Pareto Chart:** A Pareto chart was named after Vilfredo Pareto is a type of chart that contains both bars and a line graph where individual values are represented in descending order by bars, and the cumulative total is represented by the line. The purpose of the Pareto chart is to highlight the most important among a set of factors. A Pareto chart focuses on efforts or the problems that have the greatest potential for improvement by showing relative frequency and size in a descending bar graph. In quality control it often represents the most common sources of defects the highest occurring type of defect or the most frequent reasons for customer complaints.

**Scatter Diagram:** A scatter diagram is a type of mathematical diagram using Cartesian coordinates to display values for two variables for a set of data. A scatter plot is used when a variable exists that is below the control of the experimenter. If a parameter exists that is systematically incremented and decremented by the other, it is called the independent variable and is plotted along the horizontal axis. The dependent variable is plotted along the vertical axis.

**Defect Measurement:** Accounting for the number or frequency of defects that cause lapses in product or service quality.

**Process Mapping:** Illustrated description of how things get done which enables participants to visualize an entire process and identify areas of strength and weaknesses. It helps reduce cycle time and defects while recognizing the value of individual contributions.

**STATISTICAL PROCESS CONTROL**

The application of statistical methods to analyze data, study and monitor process capability and performance.

**BENEFITS OF SIX SIGMA**

Organizations which implement Six Sigma have significant benefits that contribute to competitive advantage and to changing the culture in an organisation.

**BENEFITS FOR THE ORGANIZATION**

- Six Sigma is driven by the customer its prime aim to achieve maximum customer satisfaction and minimizing the defects.
- Focuses on prevention on defects rather than fixing it
- Improvement in quality of product or service as perceived by the internal and external customer
- Focuses on the process improvement. Process cycle time reduction
- Leads to rise of profitability and reduction in costs
- Increase in employees skills development
- Use of common language throughout the organization
- Achievement in world class standard

**BENEFITS FOR THE INDIVIDUAL**

- Improvement in knowledge and skills

- Use a wide range of tools and techniques
- Worldwide recognized status

### DISCUSSION

Six sigma is a powerful tool that can help an organization to design, operate and control every process in a manner that fetches the several benefits of implementation. The goal of six sigma is to improve internal as well as external customer satisfaction and continuously improve processes throughout the organization. Champions take responsibility for Six Sigma implementation across the organization in an integrated manner. Champions also act as mentors to Black Belts. Six sigma concepts reduce sources of variation and improving quality and productivity. It also reduces and eliminates defects in occurring during the process. By implementing six sigma in industries, it receives several benefits and increases the profitability. Six sigma is a powerful tool that can transform organization for perfection.

### REFERENCES

1. Production & Operations Management by S.N. Chary Tata McGraw Hill Education Private Limited, New Delhi
2. Production ( Operations) Management by L.C.Jhamb Everest Publishing House ,Pune

### WEBSITES

3. [http://en.wikipedia.org/wiki/Six\\_sigma](http://en.wikipedia.org/wiki/Six_sigma)
4. <http://www.ge.com/sixsigma>
5. [http://en.wikipedia.org/wiki/Seven\\_Basic\\_Tools\\_of\\_Quality](http://en.wikipedia.org/wiki/Seven_Basic_Tools_of_Quality)
6. <http://www.sixsigmagroup.co.uk/Methodologies-Tools/Benefits-of-Six-Sigma.aspx>
7. <http://www.sixsigma.in/advantages-and-disadvantages-of-six-sigma.html>

## THE USE OF BUSINESS PROCESS OUTSOURCING (BPO) AND CO-SOURCING BY INDIAN BANKS

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### ABSTRACT

*The main objective of this research paper is to observe whether the selected Indian Banks are using Business Process Outsourcing (BPO) and Co-Sourcing or not and if they are using BPO & Co-Sourcing then for what purposes? This was pursued by conducting structured interview of branch heads of the selected 16 scheduled banks of Meerut (U.P.). The researcher with the help of a questionnaire inquired from the branch heads of selected banks and compared the responses with the desired state using GAP Analysis Worksheet. The study indicates that some large public sector banks with the exception of SBI and large private sector banks are only banks using BPO services that too mostly for customer Interaction Services only. The study also indicates that large public sector banks are using co-sourcing for Life, General insurance and housing finance only whereas large private sector banks are using co-sourcing for knowledge services only.*

### JEL CLASSIFICATION

M15 (IT Management)

### KEYWORDS

Business Process Outsourcing (BPO), Co-Sourcing.

### INTRODUCTION

**B**usiness Processes Outsourcing (BPO)<sup>1</sup> is the delegation of one or more IT-intensive business process to an external service provider, who, in turn, owns, administrates and manages the selected process (es) based upon defined and measurable performance metrics.

In recent years outsourcing the operation of IT systems has been supplemented by a move to outsourcing not just systems, but whole business processes. These processes can be either internal functions such as payroll processing (which do not have a direct relationship to the business of the company), moving more recently to operations which were once seen as critical to the success of the business. A good example of this is the outsourcing of cheque processing.

<sup>2</sup>The banks have been utilizing the BPO services over the past five years, having already out sourced some of their internal services such as human resources, call center, customer care and transaction processing services to third parties and in some cases to their captive centers. With more stringent norms and financial services rules have forced global and Indian banks to wake up to alternate delivering through third party BPO services.

Once such processes were ring fenced by the company as being too important for third parties to manage. However, whilst on the one hand the core services of banks are becoming increasingly technologically intensive, these services are also increasingly taking on the characteristics of hygiene factors, in that they become commodities to the point where they do not add to the competitive edge of the bank. They are a minimum requirement to remain in the market. As such, they are increasingly subjected to the possibility of outsourcing as the economic arguments described above take precedence over strategic ones. Thus the key business processes are being outsourced as they:-

- become increasingly capital intensive;
- become a generic process, common to all institutions; and
- lose their role in supplying competitive advantage.

Two major forms of business process outsourcing exist:

- Outsourcing by a number of banks forming a mutually-owned company to carry out the process
- Outsourcing to a third party

The former case is suitable for smaller and medium-sized institution, which have more difficulty in obtaining the economies of scale, in order to compete with larger companies. The fastest-growing areas of back-office outsourcing are applications process, tax compliance, sourcing / procurement, and HR. The outsourcing market follows the development of the Business process Applications (BPA) market closely. As Enterprise Resource Planning (ERP) applications for processes are developed and implemented, BPO follows by about 18 months. This progression occurs because: (1) ERP systems are the most common base technology of the outsourcing vendors that serve the corporate market, and (2) ERP systems define back-office business process and standardize it. From a process functionality standpoint, relatively little differentiation exists for back-office systems offered by major vendors SAP, Oracle, People Soft, Baan, and J.D. Edwards. This process standardization means it is possible to develop a service to deliver this process and that the effort is profitable because the market is large enough to support it.

An advantage of BPO is the way in which it helps to increase a company's flexibility. However, several sources have different ways in which they perceive organizational flexibility. Therefore business process outsourcing enhances the flexibility of an organization in different ways.

<sup>3</sup>Most services provided by BPO vendors are offered on a fee-for-service basis. This can help a company to become more flexible by transforming fixed into variable costs. <sup>4</sup>A variable cost structure helps a company responding to changes in required capacity and does not require a company to invest in assets, thereby making the company more flexible. Outsourcing may provide a firm with increased flexibility in its resource management and may reduce response times to major environmental changes.

<sup>5</sup>The key lies in knowing which of the main value drivers to focus on – customer intimacy, product leadership, or operational excellence. Focusing more on one of these drivers may help a company create a competitive edge.

<sup>6</sup>A third way in which BPO increases organizational flexibility is by increasing the speed of business processes. Supply chain management with the effective use of supply chain partners and business process outsourcing increases the speed of several business processes, such as the throughput in the case of a manufacturing company.

<sup>7</sup>Finally, flexibility is seen as a stage in the organizational life cycle: A company can maintain growth goals while avoiding standard business bottlenecks.

<sup>8</sup>BPO therefore allows firms to retain their entrepreneurial speed and agility, which they would otherwise sacrifice in order to become efficient as they expanded. It avoids a premature internal transition from its informal entrepreneurial phase to a more bureaucratic mode of operation. A company may be able to grow at a faster pace as it will be less constrained by large capital expenditures for people or equipment that may take years to amortize, may become outdated or turn out to be a poor match for the company over time.

Although the above-mentioned arguments favor the view that BPO increases the flexibility of organizations, management needs to be careful with the implementation of it as there are issues, which work against these advantages. Among problems, which arise in practice are: A failure to meet service levels, unclear contractual issues, changing requirements and unforeseen charges, and a dependence on the BPO which reduces flexibility. Consequently, these challenges need to be considered before a company decides to engage in business process outsourcing<sup>9</sup>

A further issue is that in many cases there is little that differentiates the BPO providers other than size. They often provide similar services, have similar geographic footprints, leverage similar technology stacks, and have similar Quality Improvement approaches.<sup>10</sup>

Outsourcing is not a standalone phenomenon. It is part of a larger movement within organizations to define the value-add of a process. Outsourcing will affect large corporations in several different ways:

- It will eliminate anything known as a "cost center." Corporations will run only profitable processes. All other processes will be outsourced to a company that can make money on the process.
- It will necessitate process-based costing, best known as activity-based costing (ABC). Companies will begin looking at the process as a unique business to determine whether or not it is contributing to economic profit.
- It will change the type of leaders necessary for success in large corporations. Much of the back-office processing will be done using virtual staff in virtual corporations. Managers and leaders will need to rely more on negotiation and less on hierarchical direction. Diplomatic skills will be more important than technical skills.

### <sup>11</sup>CO-SOURCING

It is a business practice where a service is performed by staff from inside an organization and also by an external service provider. Co-sourcing earns advantage over Total Outsourcing in a way that it minimizes sourcing risks, brings in transparency, clarity and better control over the processes outsourced.

With computer services companies becoming increasingly involved in their customer's business by taking over responsibility for IT and business functions, it seems logical that they have a stake in the success of the financial institutions which they work with. Recently this interest has become formalized with outsourcing companies entering into arrangement where they share their clients' business risks by supporting them to enter into new businesses. Rewards are based on the profits of these new operations. Increasingly the supply of IT resources is seen as a partnership between a bank and one or more suppliers. Indeed to start a new operation, a bank may need the support of a large hardware firm, a specialist software house, a systems integrator, a communications company and a consultancy. In recent years the largest systems integrators and now some of the hardware companies, are willing to develop complete business operations for their clients, based on mutual win / win arrangements.

The advantage of co-sourcing is that banks can share risk with IT companies, Banks get access to latest technologies and Firms can get access to business knowledge of banks to exploit their technology

The disadvantages of co-sourcing are that the arrangement is based on a win/win outcome, which conversely means that both sides lose if the business fails to deliver. Also the Management control in the long run may be a problem. IT firms are not likely to have a role in the long term running of banking business themselves, though they will accept long-run management of the IT.

### REVIEW OF LITERATURE

Parsons, Gotlieb and Denny [1993]<sup>12</sup> in their study deals with the impact of IT on banking productivity per se. Computerization is one of the factors which improves the efficiency of the banking transactions. They concluded that higher performance levels have been achieved without corresponding increase in the number of employees. Also, it has been possible for Public Sector Banks and Old Private Banks to improve their productivity and efficiency by using IT.

Healy & Palepu [2001]<sup>13</sup> in their study suggest that the use of technology can improve/enhance systems for administrative control such as enabling better management of risk, which if disclosed in regulatory reports to supervisors and in annual reports to investors, can improve bank transparency and enable the banks to reduce their cost of capital. Hence, technology can be the key to differentiation, competitive edge, and institutional survival.

Rajshekhar K. S. [2004]<sup>14</sup> in his study described the adoption of IT in banking has undergone several changes with the passage of time. Today IT has become an inseparable segment of banking organization. The application of information technology in the banking sector resulted in the development of different concepts of banking such as – E-banking, Internet Banking, Online Banking, Telephone Banking, Automated teller machine, universal banking and investment banking etc. Information technology has a lot of influence on banking transactions. It ensures quick service with low transaction cost to the customers. The real success of IT in the banking sector depends upon the customer's satisfaction. Therefore banks should organize and conduct customer awareness program in their service area. Security is an important issue in the context of E-banking. The development of technology for the identification of customers with different means of communication devices is a must for successful business and also to reduce frauds in banking. In this paper the author has studied customer related aspects only. This paper do not present any study related to the bank employees and their problems regarding bank computerisation.

Rishi & Saxena [2004]<sup>15</sup> in their study suggest that the advancements in information and telecommunication technologies (IT) since past 25 years clearly indicate a positive impact on banking and financial institutions. Innovations in information technology and development in IT sector has been enforced the convention of IT elements in maximum branch of banks. Public sector banks were late adopter of new technology as compare to private and foreign banks.

Mittal & Dhingra [2007]<sup>16</sup> in their study suggest that Indian banking industry has witnessed a remarkable development in the Informational Technology (IT) in last few years. Banking transactions are become easier and customer friendly due to the technological improvements. To play a supportive and key role, banks are providing with lots of services which are the combination of electronics and information technology, like, Automatic Teller Machines (ATMs, plastic money i.e. credit card, debit card and smart cards, phone banking, e-banking which is called by net-banking, etc. ATMs have emerged as the most favored channel for offering banking services to the customers in the world.

Uppal R.K. [2009]<sup>17</sup> in his study suggests that in the emerging competitive environment and IT era, with little or no distinction in product offering, it is the speed of rendering service which sets apart one bank another. Prompt service is equated with quality service. Time is a major factor which effects quality and reputation of the bank. E-banks are providing quick service that is why they are becoming popular. Hence it is very essential that all bank groups should put in place the right kind of systems to further cut down on service time and render instantaneous service to the customer. Only such banks will tend to survive in the rat race for market shares in the days to come.

G. Koteswara Rao & Roshan Kumar [2011]<sup>18</sup> Banks can use technology to improve their performance and they can get the sustainable competitive advantage. According to our study, we can conclude that proper integration of BI & KM can help bank to get wide benefits. It includes historical context, not just a shallow examination of what is apparent and easily accessible. Instead of nuggets or pockets of information from corporate databases, it provides a true 360° view of attitudes and behaviors, combines structured and unstructured data, meshes solicited and unsolicited feedback, and keeps a real-time pulse on business (Kadayam,2002). Banks will be able to manage explicit information and there by transform the information to knowledge which in turn can help bank in making better decisions and lead them to be in a better position in contemporary business competitive environment. This integration will not only facilitate the capturing and coding of knowledge but also enhances the retrieval and sharing of knowledge across the bank to gain strategic advantage and sustain in competitive market.

Siva Prasad Ravi, Ravi Kumar Jain, Hari P. Sharma [2011]<sup>19</sup> In their study suggest that the justification for outsourcing activities, such as cash management, research and business analytics, and other processes that otherwise are considered core to the banking business, lies in the argument that these activities, though essential to the bank, do not provide a unique competitive advantage. This implies that those activities, where a bank can do better than its competitors, and which generates a competitive advantage, are retained in house and the rest are outsourced (Chris, et al.2004). The outsourcing strategy has shifted from product (and/or service) focus to that of differentiation and speed –to – market. Several studies pertaining to outsourcing in the financial services sector show a gradually growing trend in outsourcing, both in terms of nature and scope of activities outsourced, and also emphasize that outsourcing is a critical aspect of financial institutions to survive in today's business environment (Federal Bank of New York, 1999).

### HYPOTHESIS

The research work was conducted to prove the assumptions that the Indian Banks do not use Business Process Outsourcing (BPO) and also Co-Sourcing.

**OBJECTIVES OF THE STUDY**

The research work was conducted with the objective to find out whether the selected Indian Banks are using Business Process Outsourcing (BPO) and Co-Sourcing or not. Are they using Artificial Intelligence based technological application or not and if they are, then for what purposes?. The study also aims to find out if the selected Indian Banks are using BPO & Co-Sourcing then they are using them for what purposes?

**RESEARCH METHODOLOGY****SCOPE OF RESEARCH**

Since all banks follow the norms of the RBI and the computerization by banks is done as per the recommendations of committees formed by the Central Bank from time to time, therefore their policy for implementation of the computerization in branches of a particular bank are same anywhere. Therefore, the area of research chosen by the researcher is Meerut city, as it is a well developed city having branches of most of the banks.

**POPULATION**

The researcher has focused his research only on the scheduled banks. The scheduled banks are SBI & its six Associates, 19 PSU's, OTHER PUBLIC SECTOR BANK- IDBI Bank Limited, 14 OLD PRIVATE SECTOR BANKS, 7 NEW PRIVATE SECTOR BANKS, 36 FOREIGN BANKS, Regional Rural Banks (Total 82 Banks are there but in UP only 7 are present and in Meerut only 1 with only one branch). There are 53 Urban Cooperative Banks, 31 State Cooperative Banks, 371 District Central Cooperative Banks and 93413 Primary Agricultural Societies in India.

**SAMPLE DESIGN**

Since the population size is very big it was not feasible to study the entire population, so the researcher decided to go for a sample survey. In order to get a holistic representation, the researcher has used stratified sampling and scheduled banks categorized by RBI have been divided into groups referred to as strata on the basis of the Total Turnover of the banks.

**SAMPLE SIZE**

The total number of banks selected by the researcher is 16 (Sample size- 16). The list of selected banks is as shown below:

LIST OF BANKS SELECTED AS SAMPLE			
S. No.	Bank	S. No.	Bank
1	SBI- State Bank Of India	9	South Indian Bank
2	PNB- Punjab National Bank	10	Nainital Bank
3	CBI-Central Bank of Indian	11	ICICI Bank
4	Syndicate Bank	12	HDFC Bank
5	Andhra Bank	13	Axis Bank
6	Punjab & Sind Bank	14	Yes Bank
7	Bank	15	Sarva UP Gramin Bank
8	Federal Bank	16	Zila Sahkari Bank, Meerut

**RESEARCH DESIGN**

**Data Collection:** The Data is collected from primary sources only.

**Data Collection from Primary Sources:** Since all the information could not be obtained from secondary sources therefore for the collection of firsthand information for primary data, the researcher prepared a questionnaire containing various questions regarding the computerization in banking.

The branch for a bank is selected by the researcher taking into consideration the size and business of the branch, which ensures that the branch will be fully computer equipped as per bank norms. The list of selected branches in Meerut of selected 16 scheduled banks.

Then the researcher conducted well scheduled interviews and the respondents are asked to complete the questionnaire by verbally responding to questions in the presence of the researcher, through a face-to face structured interview.

The Researcher also noted on-the-spot observations by visiting the branches of the banks and using their various products and services like ATM's, Tele-Banking, SMS Banking, Net Banking, Mobile Applications, POS Terminals, Credit and Debit cards of various banks.

**Analytical Tool:** The mainly quantitative data produced by this questionnaire was analyzed by preparing tabulation sheets for use of BPO & Co-Sourcing by selected Indian banks.

**ANALYSIS & FINDINGS**

1. In Q.No.1 the researcher inquired about whether the Bank uses BPO services? If yes, the BPO is used for which services? Specify the name of company which is running the bank BPO and purpose?

TABLE 1.0: BPO IS USED BY THE BANKS FOR WHICH SERVICES & THE NAME OF COMPANY WHICH IS RUNNING THE BANK BPO & PURPOSE			
NAME OF THE BANK	Does the Bank (Branch) use BPO services	BPO is used for which services	Specify the name of the company and purpose
SBI	No	-	-
PNB	Yes	Insurance Inquiry	Achiever Enterprises- A PNB Metlife BPO
CENTRAL BANK	No	-	-
SYNDICATE BANK	yes	Customer Interaction Services	SyndBank Services Limited
ANDHRA BANK	Yes	Customer Interaction Services	Not aware
P & S BANK	No	-	-
IDBI BANK	Yes	Customer Interaction Services	IDBI Intech
FEDERAL BANK	No	-	-
SOUTH INDIAN BANK	No	-	-
NAINITAL BANK	No	-	-
ICICI BANK	Yes	Customer Interaction Services	First Source
HDFC BANK	Yes	Transaction Processing & Rural BPO	Atlas Documentary Facilitators Pvt.Ltd
AXIS BANK	Yes	Customer Contact Services (voice, email and web chat)	First Source
YES BANK	Yes	Customer Interaction Services, IT Incentive Business Processes	Not aware
SARVA UP GRAMIN BANK	No	-	-
ZILA SAHKARI BANK	No	-	-

Table No. 1.0 suggests that PNB (*Achiever Enterprises- A PNB Metlife BPO*), Syndicate Bank (Synd Services Ltd.), IDBI (IDBI Intech), HDFC (ADFC) and ICICI Bank as well as Axis Bank (Firstsource) are only banks using BPO services that too mostly for customer Interaction Services only.

Others like SBI, CBI, Punjab & Sind Bank, Federal Bank, South Indian Bank, Nanital Bank, Sarva UP Gramin Bank and Zila Sahkari Bank are not using any BPO Services.

2. In Q.No.2 the researcher inquired about whether the Bank uses co-sourcing services? If yes, the co-sourcing is used for which services? Specify the name of company which is running the bank co-sourcing and purpose?

TABLE 2.0: CO-SOURCING IS USED BY THE BANKS FOR WHICH SERVICES AND THE NAME OF COMPANY WHICH IS RUNNING THE BANK CO-SOURCING & PURPOSE			
NAME OF THE BANK	Does the Bank (Branch) use co-sourcing	co-sourcing is used for which services	Specify the name of the company and purpose
SBI	Yes	Life Insurance	SBI Life insurance is a joint venture between SBI & BNP Paribas Cardif
PNB	Yes	Life Insurance, General Insurance, Housing Finance, Investment	MetLife, Oriental Insurance, PNB Housing Finance Limited & PNB Gilts
CENTRAL BANK	No	-	-
SYNDICATE BANK	No	-	-
ANDHRA BANK	No	-	-
P & S BANK	No	-	-
IDBI BANK	No	-	-
FEDERAL BANK	No	-	-
SOUTH INDIAN BANK	Yes	Life Insurance & General Insurance	LIC & Cholamandalum
MAINITAL BANK	No	-	-
ICICI BANK	Yes	Yes Knowledge Services	Not aware
HDFC BANK	Yes	Yes Knowledge Services	Not aware
AXIS BANK	No	-	-
YES BANK	No	-	-
SARVA UP GRAMIN BANK	No	-	-
ZILA SAHKARI BANK	No	-	-

Table No. 2.0 suggests SBI is using co-sourcing for life insurance (SBI Life Insurance is a joint venture between State Bank of India and BNP Paribas Cardif), Punjab National Bank is using co-sourcing for Life and General insurance (MetLife and Oriental Insurance respectively) and PNB also uses Co-sourcing Housing Finance and Investment (*PNB Housing Finance Limited and PNB Gilts* respectively). South Indian Bank is using co-sourcing for Life and General insurance (LIC and Cholamandalum respectively).

ICICI Bank and HDFC Bank uses co-sourcing for knowledge services only.

CBI, Syndicate Bank, Andhra Bank, Punjab & Sind Bank, IDBI Bank, Federal Bank, Nanital Bank, Axis Bank, Yes Bank, Sarva UP Gramin Bank and Zila Sahkari Bank does not use co-sourcing at all.

## HYPOTHESIS TESTING

The analysis proves that the Hypothesis assumed by the researcher that the Indian Banks do not use Business Process Outsourcing (BPO) is FALSE, though partially as smaller public sector banks, Regional Rural & Cooperative Banks are not Business Process Outsourcing (BPO) at all.

The analysis proves that the Hypothesis assumed by the researcher that the Indian Banks do not Co-sourcing is TRUE, though partially as large & established public & private banks are using Co-Sourcing for other business such as insurance.

## RECOMMENDATIONS & SUGGESTIONS

Another way in which BPO & Co-Sourcing contributes to a bank's flexibility is that a bank is able to focus on its core competencies, without being burdened by the demands of bureaucratic restraints. Key employees are herewith released from performing non-core or administrative processes and can invest more time and energy in building the firm's core businesses.

## CONCLUSIONS & IMPLICATIONS

The analysis suggests that the majority of large banks in India, both public and private sector, are using BPO services that too mostly for customer Interaction Services only. The study also indicates that some large public sector banks like PNB (*Achiever Enterprises- A PNB Metlife BPO*), Syndicate Bank (Synd Services Ltd.), IDBI (IDBI Intech) with the exception of SBI and large private sector banks HDFC (ADFC), ICICI Bank and Axis Bank (Firstsource) whereas others like SBI, CBI, Punjab & Sind Bank, Federal Bank, South Indian Bank, Nanital Bank, Sarva UP Gramin Bank and Zila Sahkari Bank are not using any BPO Services.

The study also indicates that large public sector banks like SBI for life insurance (SBI Life Insurance is a joint venture between State Bank of India and BNP Paribas Cardif), Punjab National Bank for Life and General insurance (MetLife and Oriental Insurance respectively) and PNB also uses Co-sourcing Housing Finance and Investment (*PNB Housing Finance Limited and PNB Gilts* respectively) are using co-sourcing for Life, General insurance and housing finance only whereas large private sector banks like ICICI Bank and HDFC Bank are using co-sourcing for knowledge services, with the exception of South Indian Bank which is using co-sourcing for Life and General insurance (LIC and Cholamandalum respectively).

CBI, Syndicate Bank, Andhra Bank, Punjab & Sind Bank, IDBI Bank, Federal Bank, Nanital Bank, Axis Bank, Yes Bank, Sarva UP Gramin Bank and Zila Sahkari Bank does not use co-sourcing at all.

## ACKNOWLEDGEMENTS

I acknowledge the guidance and review assistance of Prof. Anoop Swarup (VC- Jagran Lake City University, Bhopal) & cooperation of my institution KITE Group of Institutions, Meerut.

## REFERENCES

### BOOKS

1. Nakkiran S., D. John Franklin, "Business Process Outsourcing (BPO): Concept, Current Trends, Management", New Delhi: Deep and Deep Publications, (2004) pp-34
2. Mehrotra Nitin, "Business Process Outsourcing - The Indian Experience", Hyderabad: ICFAI Books, (2005) pp-110
3. Willcocks, L., Hindle, J., Feeny, D. and Lacity, M., "IT and Business Process Outsourcing: The Knowledge Potential", Information Systems Management, Vol. 21, (2004) pp-7-15

4. Gilley, K.M., Rasheed, A., "Making More by Doing Less: An Analysis of Outsourcing and its Effects on Firm Performance", *Journal of Management*, 26 (4): 763-790, (2000)
5. Leavy, B., "Outsourcing strategies: opportunities and risk. *Strategy and Leadership*" 32 (6) : 20-25, (2004)
6. Tas, Jeroen, Sunder, Shyam, "Financial Services Business Process Outsourcing", *COMMUNICATIONS OF THE ACM* Vol. 47, No. 5, (2004)
7. Fischer, L.M., "From vertical to Virtual; How Nortel's Supplier Alliances Extend the enterprise [online]", *Strategy Business*, (2001), (February 2010), available from <http://www.strategy-business.com/press/16635507/11153>
8. Leavy, B., "Outsourcing strategies: opportunities and risk. *Strategy and Leadership*" 32 (6) : 20-25, (2004)

**JOURNALS**

9. Michel, Vaughan, Fitzgerald, Guy, "The IT outsourcing market place: vendors and their selection", *Journal of Information Technology* 12: 223-237, (1997)
10. Adsit, D., "Will a Toyota Emerge from the Pack of Me-Too BPO's?, In Queue", (2009) available at [http://www.nationalcallcenters.org/pubs/In\\_Queue/vol3no21.html](http://www.nationalcallcenters.org/pubs/In_Queue/vol3no21.html)
11. "Co-sourcing", accessed on Dec 2011, < <http://en.wikipedia.org/wiki/Co-sourcing>>
12. Parsons, Gotieb & Denny, "Productivity and Computers in Canadian Banking", *Productivity Issues in Services at the Micro Level*, Z. Griliches and J. Mairesse (Eds.): Kluwer, Boston (1993)
13. Healy & Palepu, "Information asymmetry, corporate disclosure, and the capital markets: a review of the empirical disclosure literature", *Journal of Accounting and Economics*, Vol. 31, No. 1-3 (2001) pp. 405-410.
14. Rajashekhara K. S., "Application of IT in Banking", *Yojana*, (July 2004) pp.22 - 25
15. Rishi & Saxena, "Technological Innovations in the Indian banking industry: the late bloomer", *Accounting, Business & Financial History*, Vol. 14 (2004) pp.339-353
16. Mittal and Dhingra, , "Investment in Information Technology and its Impact on Productivity and Profitability of Public Sector Banks in India", *Productivity Journal*, National Productivity Council, New Delhi (2007) pp.73-81
17. R.K. Uppal "Customer service in Indian commercial banks: An Empirical Study", *Asia-Pacific Journal of Social Sciences* ISSN No. 0975-5942 VOL I (1) (Jan-June 2009) pp. 127-141
18. G. Koteswara Rao & Roshan Kumar (IIM, Indore), "Framework to Integrate business intelligence and Knowledge management in banking industry", *Review of Business and Technology Research*, Vol. 4, No. 1, July 2011 pp.1-14
19. Siva Prasad Ravi (Thompson Rivers University, Canada), Ravi Kumar Jain ( Symbiosis International University, India), Hari P. Sharma (Virginia State University, Petersburg, USA), "An Analysis Of Business Process Outsourcing strategies Of Public And Private Sector Banks In India", *International Business & Economics Research Journal* , February 2011 Volume 10, Number 2 pp.1-12

**RELIABLE CLOUD STORAGE SERVICES WITH DATA INTEGRITY**

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**ABSTRACT**

Cloud computing is now days emerging field because of its performance, high availability, low cost. In the cloud many services are provided to the client by cloud. Data store is main future that cloud service provides to the companies to store huge amount of storage capacity. But still many companies are not ready to implement cloud computing technology due to lack of proper security control policy and weakness in protection which lead to many challenge in cloud computing. In this article, we focus on cloud data storage security, which has always been an important aspect of quality of service. To ensure the correctness of users' data in the cloud, we propose an effective and flexible distributed scheme with two salient features, opposing to its predecessors. The main objectives of this paper are, 1) To prevent Data access from unauthorized access, it propose a distributed scheme to provide security of the data in cloud. 2) And also performs some of the tasks like data updating, deleting, appending.

**KEYWORDS**

Cloud Computing, Architecture, Data, Integrity, Services.

**1. INTRODUCTION**

Cloud typically contains a virtualized significant pool of computing resources, which could be reallocated to different purposes within short time frames. The entire process of requesting and receiving resources is typically automated and is completed in minutes. The cloud in cloud computing is the set of hardware, software, networks, storage, services and interfaces that combines to deliver aspects of computing as a service. Share resources, software and information are provided to computers and other devices on demand. It allows people to do things they want to do on a computer without the need for them to buy and build an IT infrastructure or to understand the underlying technology. Through cloud computing clients can access standardized IT resources to deploy new applications, services or computing resources quickly without reengineering their entire infrastructure, hence making it dynamic. The core concept of cloud computing is reducing the processing burden on the users terminal by constantly improving the handling ability of the cloud. All of this is available through a simple internet connection using a standard browser. However there still exist many problems in cloud computing today, a recent survey shows that data security and privacy risks have become the primary concern for people to shift to cloud computing.

**2. RELATED CONCEPT ABOUT CLOUD**

Cloud computing is the most demanding and emerging technology throughout the world. Cloud computing is an Internet based computer technology.

**2.1 DEPLOYMENT CLOUD MODELS**

- Public cloud: the cloud infrastructure is made available to the general public people or a large industry group and provided by single service provider selling cloud services.
- Private cloud: the cloud infrastructure is operated solely for an organization. The main advantage of this model is the security, compliance and QoS.
- Community cloud: the cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns like security requirements, policy, and compliance considerations.
- Hybrid cloud: the cloud infrastructure is a combination of two or more clouds. It enables data application portability through load balancing between clouds.

**2.2 CLOUD CHARACTERISTICS**

- On demand service: cloud is large resource and service pool that you can get service or resource whenever you need by paying amount that you used.
- Ubiquitous network access: cloud provides services everywhere though standard terminal like mobile phones, laptops and personal digital assistants.
- Easy use: the most cloud provider's offers internet based interfaces which are simpler than application program interfaces so user can easily use cloud services.
- Business model: cloud is a business model because it is pay per use of service or resource.
- Location independent resource pooling: the providers computing resources are pooled to serve multiple customers using multitenant model with different physical and virtual resources dynamically assigned and reassigned according to demand.

**2.3 CLOUD SOLUTIONS**

- Infrastructure as a service: it delivers a platform virtualization environment as a service rather than purchasing servers, software, data centers.
- Software as a service: it is software that is deployed over internet and or is deployed to run behind a firewall in your LAN or PC.
- Platform as a service: this kind of cloud computing provide development environment as a service. You can use the middleman's equipment to develop your own program and deliver it to the users through internet and servers.
- Storage as a service: this is database like services billed on a utility computing basis, e.g., gigabyte per month.
- Desktop as a service: this is the provisioning of the desktop environment either within a browser or as a terminal server.

**3. CLOUD ARCHITECTURE**

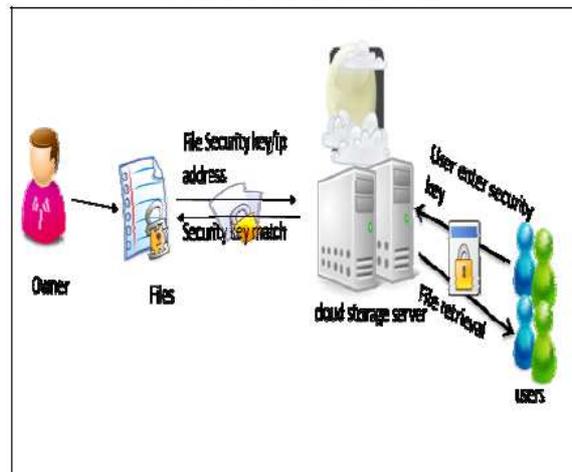
From the perspective of data security in cloud, this has always been an important aspect of quality of service. The data stored in the cloud may be frequently updated by the users, including insertion, deletion, modification, appending, reordering, etc. To ensure storage correctness under dynamic data update is hence of paramount importance. In [1], as cloud based services continues to grow, it has become clear that one of the key barriers to rapid adoption of enterprise cloud services is customer concern over data security (confidentiality, integrity, and availability).

According to sun micro systems, the concept of transparent security makes the case that the intelligent disclosure of security design, practices, and procedures can help to improve customer confidence. According to

K Ren, C.Wang and Q.Wang, cloud storage allows data owners to outsource their data to cloud.

However owners no longer have physical possession of the outsourced data raises big security concerns on the storage correctness. Hence, enabling secure storage auditing in the cloud environment with new approaches becomes imperative and challenging.

FIG 3.1: L CLOUD ARCHITECTURE



#### 4. PROBLEM STATEMENT & PROPOSED WORK

The cloud services present many challenges to an organization. When an organization migrates to consuming cloud services, and especially public cloud services, much of the computing system infrastructure will now under the control of cloud service provider. Many of these challenges should be addressed through management initiatives.

These management initiatives will require clearly delineating the ownership and responsibility roles of both the cloud provider and the organization functioning in the role of customer.

Security managers must be able to determine what detective and preventative controls exist to clearly define security posture of the organization. Although proper security controls must be implemented based on asset, threat, and vulnerability risk assessment matrices. Cloud computing security risk assessment report mainly from the vendor's point of view about security capabilities analyzed security risks faced by the cloud. Here are security risks list.

- Regulatory compliance: cloud computing providers who refuse to external audits and security certifications.
- Privileged user access: sensitive data processed outside the organization brings with it an inherent level of risk.
- Data location: when you use cloud, you probably won't know exactly where your data hosted.
- Data segregation: data in the cloud is shared environment alongside data from other customers.
- Recovery: even if you don't know where your data is, a cloud provider should tell you what will happen to your data and service in case of a disaster.
- Investigative support: investigating inappropriate or illegal activity may be impossible in cloud computing.
- Long term viability: you must be sure your data will remain available even after such an event.

##### 4.1 PROPOSED WORK

The cloud computing is a virtual environment that requires transfer data throughout the cloud. Therefore, several data storage concern can arise. Typically, users will know neither the exact location of their data nor the other sources of the data collectively stored with theirs. To preserve security of your cloud-based virtual infrastructure, perform security best practice at both the traditional IT and virtual cloud. To ensure data confidentiality, authentication, integrity, and availability, the provider should include the following:

- Encryption: the sensitivity of data may require that the network traffic to and from the virtual machine be encrypted, using encryption at the host OS software.
- Physical security: keep the virtual system and cloud management hosts safe and secure behind carded doors, and environmentally safe.
- Authentication and access control: the authentication capabilities within your virtual system should copy the way your other physical systems authenticate. One time password and biometrics should all be implemented in the same manner. Also authentication requires while you are sending data or message from one cloud to other cloud. To provide message authentication we will use digital signatures.
- Separation of duties: as system get more complex, misconfiguration take place, because lack of expertise coupled with insufficient communication. Be sure to enforce least privileges with access controls and accountability.
- Configuration, change control, and patch management: this is very important and sometimes overlooked in smaller organizations. Configuration, change control, patch management, and updated processes need to be maintained in the virtual world as well as physical world.
- Intrusion detection and prevention: what's coming into and going out of your network has to know. A host based intrusion prevention system coupled with a hypervisor based solution could examine for virtual network traffic.

#### 5. REED MULLER CODING

##### TECHNIQUES

Reed-Muller codes are among the oldest known codes and have found widespread applications. They were discovered by Muller and provided with a decoding algorithm by Reed in 1954.

These codes were initially given as binary codes, but modern generalizations to q-ary codes exist. We will restrict our investigation to the binary case.

One of the interesting things about these codes is that there are several ways to describe them and we shall look at two of these. One reason for doing this is to see how to move to the generalization even though we will not do so. For each positive integer  $m$  and each integer  $r$  with  $0 \leq r \leq m$ , there is an  $r$ th order Reed-Muller Code  $R(r,m)$ . We start our definition by considering the 1st order case ( $r = 1$ ).

**Definition:** The (first order) **Reed-Muller codes**  $R(1,m)$  are binary codes defined for all integers  $m \geq 1$ , recursively by:

(i)  $R(1,1) = \{00,01,10,11\} = \mathbb{Z}_2^2$ .

(ii) for  $m > 1$ ,

$R(1,m) = \{(u,u), (u,u+1) : u \in R(1,m-1) \text{ and } \mathbf{1} = \text{all } 1 \text{ vector}\}.$

One reason that Reed-Muller codes are useful is that there is a simple decoding algorithm for them.

We illustrate the method known as Reed Decoding with an example. Consider the code  $\mathcal{R}(1,3)$  with generator matrix:

$$\begin{pmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{pmatrix}$$

The rows of this matrix are basis vectors for the code; label them  $v_0, v_1, v_2$  and  $v_3$ . Any vector  $v$  of the code is a linear combination of these, i.e.,  $v = a_0 v_0 + a_1 v_1 + a_2 v_2 + a_3 v_3$ . Written as a vector, we have  $v = (a_0, a_0 + a_1, a_0 + a_2, a_0 + a_1 + a_2, a_0 + a_3, a_0 + a_1 + a_3, a_0 + a_2 + a_3, a_0 + a_1 + a_2 + a_3)$ .  
 $v = (a_0, a_0 + a_1, a_0 + a_2, a_0 + a_1 + a_2, a_0 + a_3, a_0 + a_1 + a_3, a_0 + a_2 + a_3, a_0 + a_1 + a_2 + a_3)$   
 If no errors occur, a received vector  $r = (y_0, y_1, y_2, y_3, y_4, y_5, y_6, y_7)$  can be used to solve for the  $a_i$  other than  $a_0$  in several ways (4 ways for each) namely:

$$a_1 = y_0 + y_1 = y_2 + y_3 = y_4 + y_5 = y_6 + y_7$$

$$a_2 = y_0 + y_2 = y_1 + y_3 = y_4 + y_6 = y_5 + y_7$$

$$a_3 = y_0 + y_4 = y_1 + y_5 = y_2 + y_6 = y_3 + y_7$$

If one error has occurred in  $r$ , then when all the calculations above are made, 3 of the 4 values will agree for each  $a_i$ , so the correct value will be obtained by majority decoding. Finally,  $a_0$  can be determined as the majority of the components of  $r + a_1 v_1 + a_2 v_2 + a_3 v_3$  (why?).

## 6. IMPLEMENTATION

The Security Development Lifecycle (SDL) is a software development security assurance process consisting of security practices grouped by seven phases Investigation, Analysis, Logical design, Physical design, Implementation, Maintenance.

**Phase1. Investigation:** Define project processes and goals, and document them in the program security policy.

**Phase2. Analysis:** Analyze existing security policies and programs, analyze current threats and controls, examine legal issues, and perform risk analysis.

**Phase3. Logical design:** Develop a security blueprint, plan incident response actions, plan business responses to disaster, and determine the feasibility of continuing and/or outsourcing the project.

**Phase4. Physical design:** Select technologies to support the security blueprint, develop a definition of a successful solution, design physical security measures to support technological solutions, and review and approve plans.

**Phase5. Implementation:** Buy or develop security solutions. At the end of this phase, present a tested package to management for approval.

**Phase6. Maintenance:** Constantly monitor, test, modify, update, and repair to respond to changing threats.

### 6.1 MAIN MODULES

#### 6.1.1 Client Module

The client sends the query to the server. Based on the query the server sends the corresponding file to the client. Before this process, the client authorization step is involved. In the server side, it checks the client name and its password for security process. If it is satisfied and then received the queries from the client and search the corresponding files in the database. Finally, find that file and send to the client.

If the server finds the intruder means, it set the alternative Path to that intruder.

#### 6.1.2 System Module

i) User

Users, who have data to be stored in the cloud and rely on the cloud for data computation, consist of both individual consumers and organizations.

ii) Cloud Service Provider (CSP)

A CSP, who has significant resources and expertise in building and managing distributed cloud storage servers, owns and operates live Cloud Computing systems.

iii) Third Party Auditor (TPA)

An optional TPA, who has expertise and capabilities that users may not have, is trusted to assess and expose risk of cloud storage services on behalf of the users upon request.

#### 6.1.3 Cloud Data Storage Module

Cloud data storage, a user stores his data through a CSP into a set of cloud servers, which are running in a simultaneous, the user interacts with the cloud servers via CSP to access or retrieve his data. In some cases, the user may need to perform block level operations on his data. Users should be equipped with security means so that they can make continuous correctness assurance of their stored data even without the existence of local copies. In case that users do not necessarily have the time, feasibility or resources to monitor their data, they can delegate the tasks to an optional trusted TPA of their respective choices. In our

model, we assume that the point-to-point communication channels between each cloud server and the user is authenticated and reliable, which can be achieved in practice with little overhead.

#### 6.1.4 Cloud Authentication Server

The Authentication Server (AS) functions as any AS would with a few additional behaviors added to the typical client-authentication protocol. The first addition is the sending of the client authentication information to the masquerading router. The AS in this model also functions as a ticketing authority, controlling permissions on the application network.

The other optional function that should be supported by the AS is the updating of client lists, causing a reduction in authentication time or even the removal of the client as a valid client depending upon the request.

#### 6.1.5 Misbehaving server model

When the user enters into cloud server and the user will start to access the file, but at the same time an unauthorized user enters into the cloud server without the proper authentication to the cloud server the particular IP address will be noticed and it makes some attention to the cloud owner.

## 7. CONCLUSION

This paper briefly explained the problems of data security in cloud data storage. And also provided a way out to ensure user correctness.

## REFERENCES

1. John W. Rittinghouse, James F. Ransome, "Cloud Computing Implementation, Management, Security", CRC Press 2009 by Taylor and Francis Group, LLC.
2. H. Shacham and B. Waters, "Compact Proofs of Retrievability," Proc. of Asiacrypt '08, Dec. 2008.
3. G. Ateniese, R. D. Pietro, L.V. Mancini and G. Tsudik, "Scalable and Efficient Provable Data Possession," Proc of Securecomm'08.
4. M.A Shah, M.Baker, J.C.Mogul, "Auditing to Keep Online storage services Honest," Proc 11th USENIX Workshop on Hot Topics in Operating Systems (HOTOS'07). pp. 1-6, 2007.
5. T.S.J.Schwarz and E.L.Millerds, "Store, Forget, and check: Using Algebraic Signatures to Check Remotely administered Storage," proc. of ICDCS'06, pp. 12-12, 2006.
6. Case study: [http://eyeos.org/cloud\\_desktop](http://eyeos.org/cloud_desktop).
7. L. Carter and M. Wegman, "Universal Hash Functions," *Journal of Computer and System Sciences*,
8. <http://searchcloudcomputing.techtarget.com/resources/#parentTopic4>
9. G. Ateniese, R. Burns, R. Curtmola, J. Herring, L. Kissner, Z. Peterson, and D. Song, "Provable Data Possession at Untrusted Stores," Proc. Of CCS '07, pp. 598-609, 2007.

## PB FREE SOLDERING INSPECTION OF PCBA

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**ABSTRACT**

*This paper is focused on to the PB(Lead) free soldering of printed circuit board inspection system based on image processing and pattern recognition techniques. A novel lighting method is adopted to inspect the solder fillet through which it is possible to inspect the chip with fine pins, such as electrical contact between the fixture probe and solder coated via or pad for the different type such as MCS0402AT and MCT0603AT. A gradient descent algorithm is used for the image feature map matching computing. Based on this image learning function, reflow soldering of the surface mount devices can be inspected.*

**KEYWORDS**

Optimal Estimation, Printed Circuit Board (PCB), PB free SAC, Solder Joints, Steepest Descent Algorithm.

**INTRODUCTION**

With the advancement of technology of integrated circuit (IC) techniques, the electronic components become smaller and the number of IC pins has increased and the size of the circuit is reduced. The electronic components are embedded on to the Printed circuit boards (PCBs). The boards have to be inspected extensively with different methods. Though the components such as resistors are suitable for processing on automatic assembly systems, they are suitable for automatic soldering using wave or reflow, but still it has to be inspected to isolate the defects such as shorts, opens, over-etching, under-etching, pad size violations, and spurious metals. Although a great deal of work has been done in the area of PCB inspection, very little research addressed the inspection of solder joints. The objective of inspection of PB free PCB is to identify typical solder joint defects on PCBs such as missing solder, cold solder, excess solder, blowholes, voids, and broken solder joints. Mismatch of the components inserted on to the PCB should also be inspected. As the electronic industry begins to focus upon tin-silver-copper family of alloy as a viable replacement for tin-lead solders, the tin-silver-copper family of alloys has earned a great deal of positive response from various industries. The best manufacturing practices for lead free SAC (tin, silver, copper) ideal temp is 650F – 700 maximum. SAC alloy produced a visual characteristic identical to cold solder fillet. It also produces an increase in wetting contact angle. Soldering lead free with a bottom pre-heater at around 150 to 200f or from a heat gun promotes much better wetting as silver has a higher melting point to achieve its liquidous phase.

Image processing and pattern recognition techniques play an important role in this area. The binary image can be drawn from the original one. By comparing the solder joint areas or the circumferences, the evaluation can be carried out. Another way is to compare the acquired image with the original one. The difference between the two images will give the result.

**INSPECTION SYSTEM**

The process starts with imaging the object to be inspected by a sensor (or sensors) from which visual data are collected and sent to the processor for analysis. Features representing the object are then extracted and matched to a predefined model. The feature-to-model matching process is the most common technique for detecting defects. Figure 1 gives a schematic of the inspection system. A one-dimensional line camera is used to acquire the data from the reflect mirror. In order to characterize the solder fillet, a novel lighting technique is adopted (as shown in Fig.2). There are seven LED array boards in the lighting equipment. After the camera acquires a single line, the LED array switches from one to another, i.e. changing the illuminating angle. A linear actuator will move the PCB along the x and y directions. As usual, the width of the solder fillet varies from 0.35 mm to 2.05 mm representing the pad dimensions as G,Y,X and Z as shown in Figure 3 and multiple pixels can be acquired from this area. But corresponding images acquired by the fixed or movable camera are all the same. So, if the line sensor is applied and every pixel is acquired at different illuminating angles, the corresponding image will be different as shown in Fig.4. In fact, this technique carries out an image fusion procedure. Other than fusing the whole image, it combines the (pixel) lines obtained at different illumination conditions into one image. It is possible to inspect the fine pin by this technique.

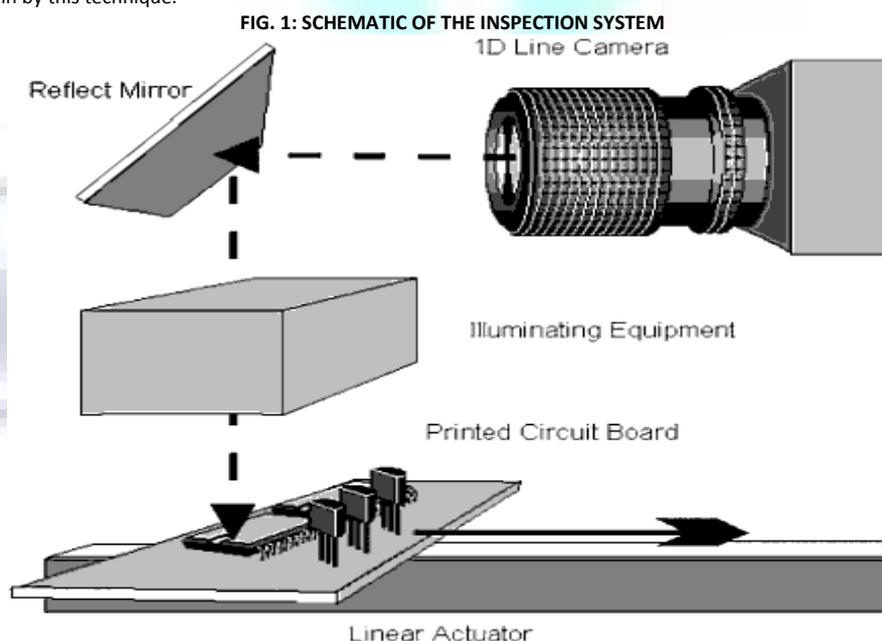


FIG. 2: THE ILLUMINATING METHOD

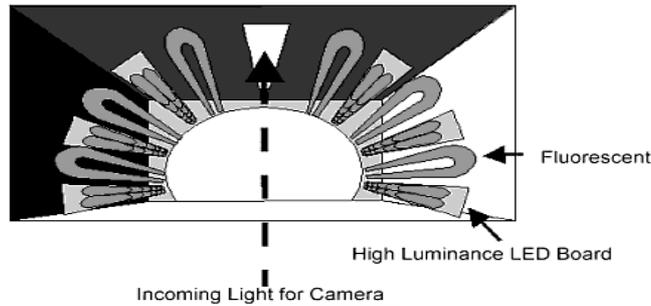
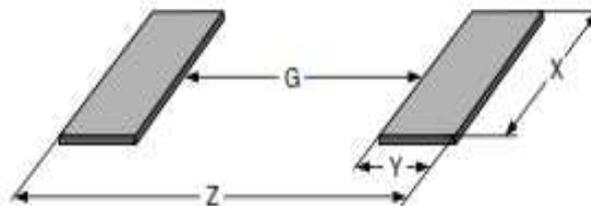


FIG. 3: THE DIFFERENT IMAGES OBTAINED AT DIFFERENT ILLUMINATING CONDITIONS



FIG. 4: THE ILLUMINATING METHOD



**IMAGE ANALYSIS**

The judgment is made based on the correlation values of the images or the comparison of the image feature maps [2,3]. Three methods are involved:

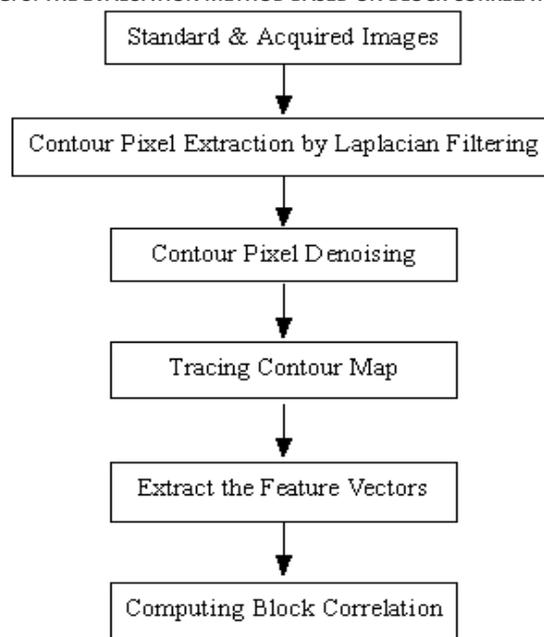
- Computing the correlation value between the standard image and the image obtained at different illuminating conditions;
- Computing the block correlation value of the acquired images; and
- Comparing the contour vector of the standard image and that of the acquired image.

For an effective computation, a so-called steepest descent algorithm is employed for the image feature map matching. And an optimal estimation procedure is carried out for the inspection of the reflow soldering of DIP. Depending on the images obtained at different illuminating conditions, the fillet correlation should be obtained. And this can be done by two steps: first, computing the correlation between the standard image and the acquired image at every illuminating angle; second, computing the fillet correlation, i.e. the product of all the correlation values obtained at the first step (as shown in formula (1)). Finally, compare the fillet correlation value with the threshold.

$$\prod_n^{N} (Corr)_n = FC \tag{1}$$

Here,  $(Corr)_n$  means the correlation value obtained at illuminating angle  $n$  and  $FC$  stands for the fillet correlation. If the fillet correlation value is under the threshold, the fillet is regarded as abnormal. For the fillet correlation is the product of all the correlation values. The procedure of computing the block correlation is given in Fig.5. Both the standard image and acquired image are divided into blocks. The correlation values between the corresponding blocks are calculated for the evaluation. The third method mentioned above is the evaluation from the edge map. Edge maps of both the standard image and input image are extracted. The difference between these two maps can be evaluated by the rotation and translation parameters. If two points on a line  $(x1,y1)$  and  $(x2,y2)$  correspond to the other two points  $(X1,Y1)$  and  $(X2,Y2)$ , the rotation and the translation can be computed by formula (2) and (3) respectively. The threshold value  $\vartheta_s$  and  $a_s$  are firstly set up by the operator.

FIG. 5: THE EVALUATION METHOD BASED ON BLOCK CORRELATION



$$\theta = \left\| \arctan \frac{Y_1 - y_1}{X_1 - x_1} - \arctan \frac{Y_2 - y_2}{X_2 - x_2} \right\| \quad (2)$$

$$d = \sqrt{\left( \frac{x_1 + x_2}{2} - \frac{X_1 + X_2}{2} \right)^2 + \left( \frac{y_1 + y_2}{2} - \frac{Y_1 + Y_2}{2} \right)^2} \quad (3)$$

The methods introduced above are the basic ones. To improve the computing efficiency, the following methods are adopted:

**STEEPEST DESCENT ALGORITHM (SDA)**

To apply the SDA to 2D image, the two steps below should be followed: The minimum thinning out value is assigned zero. The initialization of the thinning out value is assigned K. D is assigned to the initial search range. There is:

$$-D < dx < D, \quad -D < dy < D \quad (dx, dy):$$

nearby search vector

Firstly, the thinned-out standard image and the acquired one are compared by the evaluation function around the following area. And the maximum value is searched.

$$\begin{matrix} (-D/2, -D/2), & (0, -D/2), & (+D/2, -D/2) \\ (-D/2, 0), & (0, 0), & (+D/2, 0) \\ (-D/2, +D/2), & (-D/2, +D/2), & (+D/2, +D/2) \end{matrix}$$

Secondly, decrease the thinning out value to the half, i.e.  $D = D/2$ . The iterative operation is carried out until  $D = 1$ . By this method, a logarithmic decrease on computation can be achieved.

In the above example, the eight pixels around the center one are involved in computing. In practical application, the number of the pixels around can be added or removed basing on the complexity of the image content. And the initial thinning out value can also be adjusted for different images. If the correlation value is less than the threshold, the computation near that block should be carried out again with the different initial thinning out values and different neighbors.

**OPTIMAL ESTIMATION**

It is really a time-consuming work to extract a DIP image from a 10000x10000 pixel image. The methods include:

1. extracting the feature pixels of the DIP image;
2. extracting the parts with high cross-correlation value, which are achieved by a method similar to SDA.

The matching operation will be applied to the feature images. The selection of A and B will finally maximize the matching result. The (4) will ultimately converge to the minimum value.

$$S + \alpha R / N \quad (4)$$

where S is the reduction component;  $\alpha$  is the mortgage parameter; N is the iteration times; and R is the random number.

**CONCLUSION**

In this paper, a Pb free PCB inspection system based on optical-electronic technique is described. The novel illuminating method is adopted to inspect the solder fillet by computing the fillet correlation. The techniques for effectively analyzing the image are developed: the steepest descent algorithm and optimal estimation.

**REFERENCES**

1. R.T. Chin, "Survey: Automated Visual Inspection: 1981-1987", Computer Vision, Graphics, and Image Processing 41:346-381 (1988)
2. M. Sasai, "Inspection Technique for Flexible Manufacture", Electronic Packaging Technology, (14)2:41-46 (December 1998) (in Japanese)
3. Mega Trade, Manual of Miracle AIP-4000 (2000)

**QUERY BASED IMAGE RETRIEVAL USING NEAREST NEIGHBORS****K. SELVAM****ASST. PROFESSOR (CSE)****PARISUTHAM INSTITUTE OF TECHNOLOGY & SCIENCE****THANJAVUR****G. LAKSHUMANAKUMAR****ASST. PROFESSOR (CSE)****GANAPATHY CHETTIAR COLLEGE OF ENGINEERING & TECHNOLOGY****RAMANATHAPURAM****K. L. SHUNMUGANATHAN****HEAD****DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING****RMK ENGINEERING COLLEGE****GUMMIDIPOONDI****ABSTRACT**

Image retrieval has been the vast research area for past several years in the field content based image retrieval ,since there are a lot Techniques are used here query based retrieval is the good and useful thing.In this paper QBIR is discussed with nearest neighbor for retrieving of images from the databases. To achieve this here a tool is used named as "TIRUMN" .Using this the query image is matched with the image which should be available in the databases. For Matching purposes nearest neighbor algorithm is used. The proposed system will provides very keen results.

**KEYWORDS**

Image retrieval, Matching, image databases, Query image, Tool.

**1.1 INTRODUCTION**

An image retrieval method is a computer based system for surfing, browsing, searching and matching retrieving the desired images from a huge database of digital images [1].These image databases consist of a huge set of images. This stored images may be used for kind of applications still the respective image should be in the databases. Retrieving one of the good methods which is used in content based images retrieval based on some queries[2] These funny things are details discussed in this article sequentially.

**1.2 DATABASES**

In the qbir databases done a vital roles. Today there are unlimited collections of databases are used for any kind of image processing applications .In this paper the database used is natural images(like sceneries, flowers ,buildings, naturals) named as tirumn databases(collection of images).This databases consist of thousands of images for selecting a query images. The images which is in the databases should be in the same format(like jpeg,png,bmb etc).



Some images in the image database.

**2. IMAGE RETRIEVAL SYSTEM****2.1. IMAGE FETCHING**

Fetching the images is an art in the computer vision technology since there a huge and huge set of methods and algorithms are here the image read in the general methods .Main focus is reteriving of images. In the huge set of database(folder) user can select any image refereed as query image for to match the image with other images inside the image databases. when in the selection process the notified process is one image should be fetch for future process .The entire process is defined as "quering"(IMAGE FECTCHING).

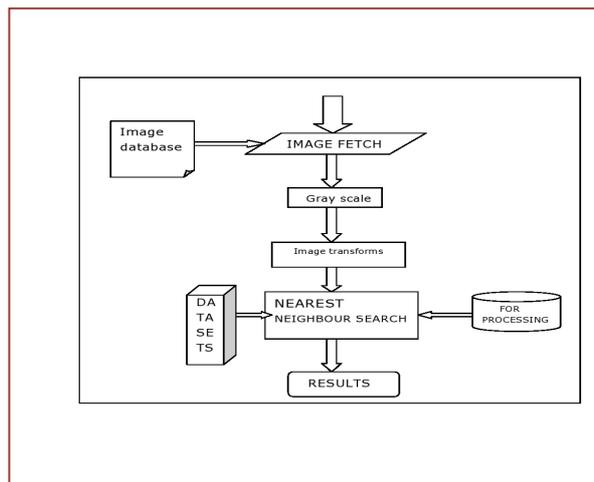


Image retrieval USING nearest neighbor.

## 2.2 TIRUMN GUI TOOL

This is the tool which is used to retrieving the images for selecting and fetching and matching the images with the other images which is available in the image databases. The entire process done with this tool called as "TIRUMN TOOL".



## 2.3 GRAY SCALE

Gray scale is the major factor in digital images processing but also in the computer visions. The intensity values of images are referred as gray scale. This is the first process in this Truman utility tool for finding the nearest neighbors. Grayscale is calculated using basic methods functions.

## 3 NOISE REMOVAL AND FILTER METHODS

### 3.1 HISTOGRAM

Distribution of graphical data. There are nearly more than ten methods are there to find the histogram. With getting the correct distribution then only the next step is possible. In general "distribution of pixel values" is referred as HISTOGRAM.

### 3.2 THE MEHTOD OF COLORAUTO CORRELOGRAM

The color auto correlogram transmit the idea of existence of larger or smaller areas of a certain color within the image. It gives the image statistics. This can be done using histograms<sup>[3]</sup>.

### 3.3 COLOR MOMENTS ORIGIN PRIMITIVES

The color moments gives the neat idea about mean value and the variance and the skewness. Moments of image pixels is clearly defined using the color moments methodologies. color moments have been proved to be efficient in representing color distribution of images<sup>[4]</sup>.

## 4. IMAGE TRANSFORMS

Image transforms is the most important aspect in the content based image retrieval systems that uses some simple arithmetic calculations on images or complex mathematical Notations in terms of operations which convert images from one representation to another information extraction is referred as image transforms for the desired format for your future representations. The filters are there to make it keen and also convolutions are also done. There are nearly a list of countable methods are there for image transforms. In this article the basic methods are only used for all the discussion here before<sup>[5]</sup>.

## 5. SEARING AND MATCHING METHODS

In the content based image retrieval searching and matching algorithms are the very important process and also final process. In this paper the images are searched using the nearest neighbor algorithms. The steps is to starts with finding the new point.

### 5.1 CLASSIFICATION OF A NEW POINT

Find the nearest neighbor in the all the data called test data and then label the new point according to which set contains the majority of its k neighbors(k nearest neighbor).

### 5.2 MATCHING

From the point of the query image that is checked with all test data with k number of nearest neighbors.(code attached).

First all the points of training data are observed Find the exact image .There a lot of images going to be used. The simplest and well used method is nearest neighbor search. In the nearest neighbor search the training data is there and that is compared with the test data and the distances are calculated methods can also be implemented using with respect to the lot of methods.

### 5.2 SAMPLE OUPUTS

Processing orientation 1

Processing orientation 2  
 Processing orientation 3  
 Processing orientation 4  
 Processing orientation 5  
 Processing orientation 6  
 Code for <Variation in Phase Symetry> Starts  
 Taking Median for scale 1/4  
 Taking Median for scale 2/4  
 Taking Median for scale 3/4  
 Taking Median for scale 4/4  
 Code End for <Variation in Phase Symetry>

## 6. EXPERIMENT RESULTS

The experiment was conducted on a set of 1000 images. The dataset was obtained from internet. The database consists of 100 images of every class. The images are taken from different viewpoints but under approximately constant illumination conditions. The image resolution is resized to 256 x 256 pixels irrespective of its prior resolution.

### APPENDIX

```
%TO call the entire function:
function [precision, recall, cmat] = knn(Returned images, dataset, ImageFeature, numeric values)
%# load dataset and extract image names
img = dataset(:, end);
dataset(:, end) = [];
% extract image name from queryImageFeatureVector
quy_iname=queryImageFeatureVector(:, end);
queryImageFeatureVector(:, end) = [];
Find the image labels:
k= length(dataset);
lIs = zeros(k, 1);
for n = 0:length(lbls)-1
    if (img(k+1) >= -1 && img(k+1) <= 100)
        lIs(k+1) = 1;
    elseif (img(k+1) > 100 && img(k+1) < 200)
        lIs(k+1) = 2;
    elseif (img(k+1) >= 200 && img(k+1) < 300)
        lIs(k+1) = 3;
    elseif (img(k+1) >= 300 && img(k+1) < 400)
        lIs(k+1) = 4;
    elseif (img(k+1) >= 400 && img(k+1) < 500)
        lIs(k+1) = 5;
    elseif (img(k+1) >= 500 && img(k+1) < 600)
        lIs(k+1) = 6;
    elseif (img(k+1) >= 600 && img(k+1) < 700)
        lIs(k+1) = 7;
    elseif (img(k+1) >= 700 && img(k+1) < 800)
        lIs(k+1) = 8;
    elseif (img(k+1) >= 800 && img(k+1) < 900)
        lIs(k+1) = 9;
    elseif (img(k+1) >= 900 && img(k+1) < 1000)
        lIs(k+1) = 10;
    end
end
Taking gray values
[g gn] = grp2idx(lIs);
[trIdx tstIdx] = crossvalind('HoldOut', lIs, 1/2);
pairwise = nchoosek(1:size(gn, 1), 2);
knn = cell(size(pairwise, 1), 1); predTest = zeros(sum(testIdx), numel(knnModel));
%# classify using one-against-one approach, knn
for k=1:numel(knnModel)
    %# get only training instances belonging to this pair
    ix = trainIdx & any( bsxfun(@eq, g, pairwise(k,:)) , 2 );
    knnModel{k} = knn(dataset(ix,:), g(ix), ...
    'BoxConstraint', Inf, 'Kernel_Function', 'rbf', 'rbf_sigma', 14.51);
    prdTst(:,k) = knnclassify(knn{k}, dataset(tstIdx,:)); % matlab native KNN function
end
pred = mode(prdTst, 2);
cmat = confusionmat(g(testIdx), pred);
final_acc=100*sum(diag(cmat))./sum(cmat(:));
precision = zeros(size(gn, 1), 1);
recall = zeros(size(gn, 1), 1);
precision = cmat(1, 1)/sum(cmat(:, 1));
for c = 2:size(gn, 1)
    precision(c) = cmat(c, c)/sum(cmat(c:end, c));
    recall(c) = cmat(c, c)/sum(cmat(c, c:end));
end
```

```
for k = 1:numel(knnModel)
    predQueryImg(:,k)=
    knnclassify(knnModel{k},queryImageFeatureVector);
end
predFinalQueryImg=mode(predQueryImg, 2);
fprintf('Predicted Query Image Belongs to Class = %d\n', predFinalQueryImg);
dataset = [dataset img_names lbls];
imgsInClassX = dataset( find( dataset(:, end) == predFinalQueryImg ), : );
imgsInClassXWithoutLbls= imgsInClassX;
imgsInClassXWithoutLlbls(:, end)=[];
L2(numOfReturnedImgs, [queryImageFeatureVector query_img_name], imgsInClassXWithoutLlbls, metric);
End.
```

## REFERENCES

1. Sang-Mi Lee, Hee-Jung Bae and Sung-Hwan Jung, "Efficient Content based Image Retrieval Methods using Color & Texture," ETRI Journal, Vol. 20, No. 3, pp.272-283, 1998
2. Vaishali D. Dhale , A. R. Mahajan, Uma Thakur, "A Survey of Feature Extraction Methods for Image Retrieval," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 10, October 2012 ISSN: 2277 128X.
3. HUANG, J. et al. (1997). Image indexing using color correlograms. Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition, San Juan, Puerto Rico, p. 762-768.
4. Hu M.K. (1962), Visual pattern recognition by moment invariants, computer methods in image analysis. IRE Transactions on Information Theory, Vol. 8.
5. Daubechies, I. (1992), *Ten lectures on wavelets*, CBMS-NSF conference series in applied mathematics. SIAM Ed.

## WEBSITE

6. <http://www.mathworks.com>.

**KNOWLEDGE BANK: AN INITIATIVE FOR ACADEMIC EXCELLENCE**

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**ABSTRACT**

Knowledge sharing is an important process in the knowledge management. Education systems are the key sources of knowledge. The created knowledge in the educational organizations must be saved and accessed whenever required but currently there is no any platform for knowledge sharing. So knowledge may be lost and it is not transformed from one generation to other. To reduce this knowledge loss a framework for knowledge management in academics is created; outcome of which is knowledge bank. Knowledge bank is software created for knowledge sharing among staff members and students. The problem of implementing knowledge bank in college is studied and its effectiveness in the education is identified. This paper focuses on the concept of knowledge sharing in academics. In real life there is big research gap across the institution for knowledge sharing.

**KEYWORDS**

Knowledge, knowledge management, knowledge bank, knowledge elements.

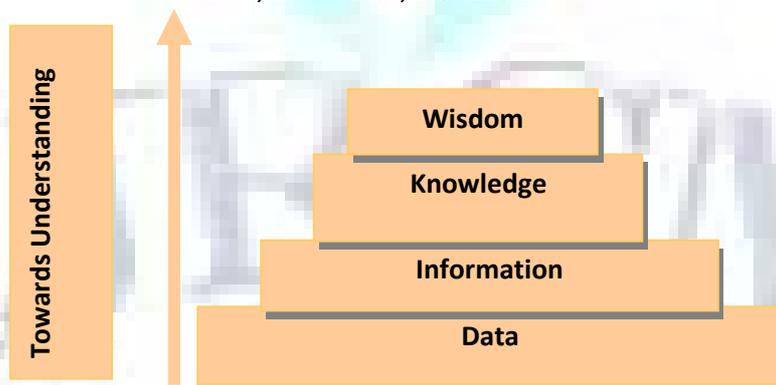
**INTRODUCTION**

Education systems are the key sources of knowledge generation. The generated knowledge will have importance if and only if it is shared. It has been observed that there are so many difficulties for knowledge sharing itself. But as innovations are going on different methods of knowledge sharing such as network technologies, search engines, portals, groupware and discussion forums are used. All these methods involve strong use of computers. But there are so many peoples in education industry they want to share knowledge and no any simple platform is available for it. Knowledge Bank provide simple platform for sharing knowledge in education industry. The knowledge can be deposited in bank and can be withdrawn whenever necessary. The effective use of knowledge bank increases in academic excellence. Basically success of knowledge management program depends on the right environment created by organization with a strong commitment of all members to sharing of knowledge.

**REVIEW OF LITERATURE**

Knowledge is our most valuable resource and knowledge management (KM) ensures that it is preserved and made available at the right time and in the right form. In general three things come into picture by the word knowledge. We are familiar with the state of knowing which is equated with recognizing of the facts, methods, principles, and techniques. This is commonly worded as "know what". Secondly we use the word knowledge for different techniques used for grasping of facts, methods principles and correspond to "know how". Third we use the term knowledge to refer to modified, codified, captured facts methods, principles and so on (i.e. in the form of books, papers, documents, formulas, computer code etc.) which will be used in the process of decision making and is "know why". (Nickols, F. W., 2000)

Describing the difference between information and knowledge is difficult because both terms are often used interchangeably. The sequence data → information → knowledge → wisdom represents an emergent continuum as shown in Figure 1.

**FIGURE 1: DATA, INFORMATION, KNOWLEDGE AND WISDOM**

There are two types of knowledge.

- 1) Tacit knowledge
- 2) Explicit knowledge.

- 1) **TACIT KNOWLEDGE** - The identifying attributes of tacit knowledge can be summarized as follows [wikipedia]
  - Subjective, cognitive, experiential learning
  - Hard to document
  - Hard to transfer / teach / learn
  - Involves a lot of human interpretation
  - Individual Expertise, Memories, Values, Beliefs and Viewpoints

An example of the problems of tacit knowledge is the Bessemer process – Bessemer sold a patent to his advanced steel making process and was sued by the purchasers who couldn't get it to work – in the end Bessemer set up his own steel company which became one of the largest in the world and changed the face of steel making.

2) **EXPLICIT KNOWLEDGE** - Explicit knowledge is increasingly being emphasized in both practice and literature. Groupware, intranets, list servers, knowledge repositories, database management and knowledge action networks allow the sharing of organizational knowledge (Scarborough et al, 1999). The identifying attributes of explicit knowledge and the ones that clearly distinguish it from tacit knowledge are summarized below.

- Objective, rational, technical.
- Easily documented.
- Easily transferred / taught / learned.
- Process of communication from one place to another in a systematic way and is more formal and codified.

Knowledge management involves enhancing organizational knowledge through sound practices of information management and organizational learning. KM is aimed at achieving organizational goals as stated below. Knowledge management is a process for optimizing the effective application of intellectual capital to achieve objectives (Webizus consulting, 2003).

Knowledge Management System (KM System) refers to a (generally IT based) system for managing knowledge in organizations, supporting creation, capture, storage and dissemination of information.

Following table provides the evolution of knowledge Management over decades(studygalaxy,2012).

The 2000 → Knowledge Management Knowledge Sharing Culture Enterprise Integration Intellectual Capital Harnessing
The 90s → Learning Organization Market Valuation Information Systems Intranets/Extranets Re-engineering
The 80s → TQM Downsizing
The 70s → Strategic Planning Portfolio Management Automation
The 60s → Centralization And Decentralization Conglomeration
The 50s → Diversification EDP Quantitative Management Management By Objectives (MBO)

## CHALLENGES FACING KNOWLEDGE MANAGEMENT IN EDUCATION

The Knowledge Management in Education Summit, held in December 2002 in San Francisco, California, was the first professional gathering in the United States focusing on the role of knowledge management in education. The Summit addressed opportunities and challenges faced by organization's peoples to improve the use and sharing information in education through practices. Knowledge management brings together three core organizational resources- people, processes and technologies to enable the organization to use and share information more effectively. Organizations should promote policies and practices that help people to share and manage the knowledge. Technology is the vital contributor for the health and effectiveness of the organization. The most effective technology is the user groups for exchanges of information across departments. So practically for implementation of knowledge management in education there are seven suggestions.

- 1) **Build on the vocabulary and practices of the organizational context:** In many organizations most of the peoples don't use data, information in decision making processes. These peoples use experiences and their own methods for decision making. Rather than peoples using their own experiences, open ending discussion will be held while processing processes and the vocabulary and practices will be developed. Peoples have begun to use knowledge management practices without reference to the term knowledge management. Many practices such as collaboration, teamwork, and collegiality can be effectively used to build for the support of knowledge management.
- 2) **Focus on the people and their needs and go where the energy is:** There is no single practice or method used for managing knowledge in the organization. It is the role of the organization to promote policies and practices that help people who share and manage the knowledge effectively. When there is no collaboration, less capacity of the organization and no funding, then implementing knowledge management are difficult. So there must be desire in the peoples mind for helping the peoples in the organization. Information sharing norms should be created for the communities who share the knowledge.
- 3) **Make explicit the work processes and patterns of information flow:** Information and knowledge audits can be performed for examining work processes. For instance, the staffs who are burdened with different type of routine processes are examined according to organizational goals. Trigger points can be identified for information sharing in the organization.
- 4) **Make sure technology is on board but do not let it steer the ship:** Technologies plays important role in efficient and automated means to track data over time, interact with peoples, post the information and share the discoveries. The most successful technology implementations are those that are accepted by human based strategies and from an understanding of the patterns of information use already present. People should be aware of the technology which they are using for knowledge sharing; they have the responsibility of using that technology otherwise peoples will not maintain the technology and the benefits of knowledge sharing will be lost.
- 5) **Improve student learning and outcomes, don't settle for procedural tinkering:** Different learning and teaching strategies are used to improve students learning. At the time of examination teachers should draw different kind of questions and gather the outcome and then the results are reviewed. Such kind of processes promotes participation, interaction and learning to the teacher as well as student also.
- 6) **Expect an iterative process that endures over time:** Knowledge management is the process that endures over time.

- 7) **Consider the larger picture:** By starting from small processes a vision of large picture will be maintained. Peoples should be rewarded for sharing information then it positively reflects. When Knowledge management is used in overall organization functioning processes then it gives better outcomes (Petrides L. & Nodine T., 2003).

### STATEMENT OF PROBLEM

Knowledge is present in talents, concepts, root causes, ideas, judgments, observations, relationships, decisions and a concept of every individual. For knowledge to have value it should be shared, tasted and used. Each field is benefited from knowledge management. Even an academic institute can be benefited from knowledge management. In academic institute no formal knowledge management is in place. The Knowledge sharing is important process in knowledge management. The transfer of knowledge from a knowledgeable teacher to his colleagues happens informally and depends on the initiatives taken by both. The new teacher may face problems while teaching the subject, drawing its question papers and taking practicles. But if the experienced teacher do not share any kind of data or guidelines then it is difficult for the new teacher to teach the subject. Proper methods of storing knowledge are not applied, the knowledge may be lost and is not passed over to the next generation. One good example is what happened in NASA (National Aeronautics and Space Administration) admitted publicly that the knowledge of how to put a man on the moon has been lost. The lessons that were learned and innovations that were sparked cannot be found in the organizational memory of NASA (By Dr. K.L Dalkir AP in McGill Graduate School of Information and Library Studies).

To reduce the loss knowledge should be stored in a stable easily accessible, cumulative knowledge base (i.e. knowledge bank) and retain and make available when needed by providing an easy to use and efficient interface. Knowledge management is aimed at achieving this goal. Providing a knowledge bank to a newly recruited teacher can excel the quality of teaching.

### OBJECTIVES

- 1) To develop an understanding of concepts and the theories in the areas of knowledge management.
- 2) To understand the need for Knowledge bank.
- 3) To provide an interface for effective and easy use of Knowledge bank.
- 4) Design framework and partly implement knowledge bank for academic institute.

### RESEARCH METHODOLOGY

Data should be in qualitative form collected from academic institute through interviews, observations, questionnaires, different research papers, journals, question formats, examples case studies, practicals, class room lectures, etc. From this data different initiatives of knowledge management will be identified. Knowledge bank is one of the initiatives for knowledge management and to develop it what are the different technological requirements are identified. Knowledge bank will be implemented with Java as front end and XML as back end.

### DIFFERENT INITIATIVES OF KNOWLEDGE MANAGEMENT

Technology is the most important imperative for knowledge management. Effective knowledge management typically requires an appropriate combination of technology. Knowledge Management cannot be implemented by putting up a single, however complex, system in place to manage knowledge. It is an integration of several information systems initiatives that help to people to create and share knowledge effectively.

- 1) **Portals:** These are designed to organize Web-based information sources on one desktop interface. It combines several Internet technologies such as search tool, new feeds, links to favourite web site, content organized by topic, and so forth.
- 2) **Groupware and discussion forums:** Groupware is asset of hardware, software, people and procedures designed to help groups work together (Dennis A., Poothari S. and Natharajan V., 1996). Traditional groupware had been focused primarily on private, often LAN based, internal networks but web groupware brings together group members in different locations working on different platforms. Web groupware allows any –place-ant-time interaction so long as there is an Internet connection. It allows for Parallel communication, ideas, and opinions simultaneously (Swallows knowledge, TCB books). E-mail, voice mail, audio video conferencing is used as an effective electronic collaboration tool. It connects experts with the seekers of that expertise, recognizing the power of conversation to convey critical knowledge (Gundry J. and Metes G, 1996).
- 3) **Web Search Engines:** Search engine is information retrieval system designed to help find information stored on computer system. Search engines help to minimize the time required to find the information and the amount of information that will be consulted.
- 4) **Document Management Systems:** A document or report is information but document representation style or report format is a knowledge element which can be reused as a template for generating similar documents and reports.
- 5) **Knowledge Bank:** World Bank president James Wolfensohn articulated the idea of the knowledge bank in 1996. Building a knowledge bank for an organization can encourage the administrators, lecturers, researchers, information workers, and librarians to submit their own digital contents. The Knowledge Bank is all about depositing and retrieving knowledge when needed by members of the communities.
- 6) **Knowledge discovery initiatives:** Data mining is a process of discovering knowledge from large amount of data stored in databases, data warehouses or other information repositories. The process of knowledge discovery generally involves an interactive sequence of the following steps; Data cleaning, data integration, data selection, data transformation, data mining, pattern evolution and knowledge representation (Han J. & Kamber M, 2001).

### TECHNOLOGY REQUIREMENT OF KNOWLEDGE BANK

Technologies play important role in knowledge sharing because they provide an efficient and automated means to track data over time, interact with colleagues, post information and share discoveries.

- 1) **Network:** A computer network is a group of interconnected computers. One of the goal of computer network is resource sharing. In resource sharing the different resources at different geographical location are shared. Another important goal is file transfer protocol (FTP). Using FTP different types of files are transferred from one computer to another. Peer-to-Peer Networking: A peer to peer (or P2P) computer network uses diverse connectivity between participants in a network.

Virtual Private Network- A **virtual private network (VPN)** is a private network using public network to connect remote users together So, VPN helps employees at different geographical area work together like desktop sharing.

- 2) **XML:** XML is primarily intended to meet the requirements of large –scale web content providers for industry specific markup.
- 3) **Server:** Server is a computer dedicated for processing the requests that are sent by clients (other computers) in the network. The process between client and server is called as request-response type of process. Server handles concurrent requests at a time. There are many types of servers, such as mail servers, file servers, web servers, proxy servers, Application server, communication server, database server, fax server, game server, home server, print server, standalone server and client server.
- 4) **Dynamic Data exchange:** DDE is a technology for communication between multiple applications under Microsoft Windows or OS/2. It is first introduced in 1987. The primary function of DDE is to allow Windows applications to share data. For e.g. Value in a cell in Excel could be linked to other applications, so when a value is changes in those applications that are immediately reflected in excel.
- 5) **Java Server Pages:** JSP technology enables Web developers and designers to rapidly develop and easily maintain, information-rich, dynamic Web pages that leverage existing business systems. As part of the Java technology family, JSP technology enables rapid development of Web-based applications that are platform independent (Sun Microsystems, 2008).

**IMPLEMENTATION OF KNOWLEDGE BANK (STEPS)**

The knowledge that any staff member will have will be deposited in the knowledge bank. The deposited knowledge can be withdrawn whenever needed. This knowledge bank is created for Academics. The knowledge bank will be stored on the server. There will be separate folder for each subject.

**SECURITY AND ACCESS LEVELS**

Users will be authenticated before using Knowledge Bank.

There are four types of tasks and the users will be given permissions to perform these tasks. The four tasks are

- Upload
- Search
- Download
- Remove

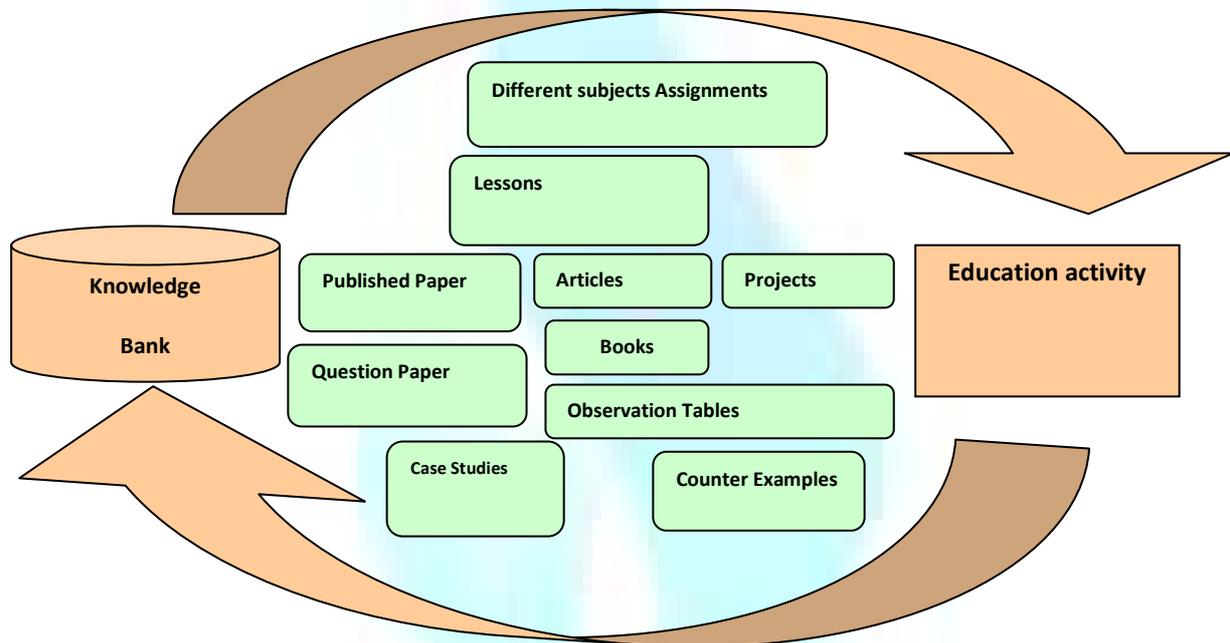
There will be one Administrator. He can only remove the knowledge elements from the bank. There are many users. All users are allowed to upload, download and search in the knowledge bank. The Permission for download will be given to only some of the users.

**Upload Interface:** After the user has logged in he will be provided interface to perform the task he is allowed. After user selects the upload option, the interface will query him about the details of knowledge element i.e. subject, special subject, year of publication of particular document (journal/article), keyword, author and the name of the file that is to be uploaded.

**Search Interface:** The search will provide options to search on such as subject, special subject, author, keywords etc. The list of documents matching the search criteria will be displayed.

**Download:** By selecting appropriate file name user can download the required document.

**Remove:** The outdated documents are removed. Only the user, which will have the authentication, will remove the documents.

**FIGURE 2: KNOWLEDGE BANK**

STEPS for implementation knowledge bank

**1) IDENTIFY THE KNOWLEDGE ELEMENTS**

For identification of knowledge elements data from different departmental laboratories was collected. Data from different staff members was collected. Interview, Observation and survey techniques are used for identifying knowledge elements. Questions will be read out to the interviewee and their responses will be noted down. Different views from different interviewee will be collected and then analysed.

**2) IDENTIFY ATTRIBUTES OF KNOWLEDGE ELEMENTS**

Any knowledge element in any subject can be understood by its attributes. Attributes clearly specify its type, need, usage; subject under consideration and its measurements. Particular knowledge element is studied. Recordable things are attributes of the knowledge elements. The other attributes vary from one knowledge element to other and these are better known to the people who create and use the knowledge element. The attributes extracted in the interview process.

**3) DESIGNING OF UPLOAD INTERFACE**

This will vary depending on knowledge element and their attributes. The different controls like Label, Text Box, radio buttons, calendar controls etc will be used for designing upload interface.

**4) DESIGNING THE SEARCH INTERFACE**

Search will depend on users of knowledge bank. Mainly those who are going to withdraw will be able to specify the search criteria. These should be uniform though knowledge elements will be having different attributes. For example author wise search, Year wise search, course wise search, subject wise search and mainly important keyword wise search. Grid Control which looks like a table can be used for displaying data according to search condition.

Figure 3 shows an example for the interface for uploading question paper into the knowledge bank.

FIGURE 3: DESIGN OF UPLOAD INTERFACE FOR QUESTION PAPER

**Upload Interface For Question Paper**

Course: MSc(Computer Science)

Subject: Computer Science

Special Subject: Networking

Subject Code: 11103

Author: Ms. Meher

Semester: I

Year: Nov 2004

Maximum Marks: 100 Total Marks: 120

Duration: 3 Hr.

Location: College Library

Format of Questions: Multiple Choice

Instructions to candidates: Draw neat and clean diagrams

File Name: c:\knowledge Bank\paper1.doc

FIGURE 4: DESIGN OF UPLOAD INTERFACE FOR BOOK

**Upload Interface For Book**

Course: MSc(Computer Science)

Subject: Computer Science

Special Subject: Data Structure

Type of Book:  Text Book  Reference Book

Book Name: Data Structure and Algorithms

Authors: Mrs. Kavita Kale

Keywords: Image Structure, Stack, Linked Lists, Queues, Trees

Number of pages: 95

Publisher Name: Tata McGraw Hill

Year: Nov 2004

Edition: Second

ISBN No.: 81-204-02345-1

Location: College Library

Comments: book is used for bca, bcs, mca, mcs

File Name: c:\knowledge bank\data1.pdf

FIGURE 5: DESIGN OF SEARCH INTERFACE

**Search Interface**

Course: MSc(Computer Science) ▾

Subject: Computer Science ▾

Special Subject: Networking ▾

Authors: Ms. Meher

Year: Nov 2008 ▾

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

Knowledge Elements

Question Paper     Book     Published paper

Counter example     Article     Case Study

Observation Table     Lecture     Projects

Written Assignment

## RESULT AND DISCUSSION

College is the most important educational institute where more knowledge interaction between teacher and student happens. There are lots of other subjects & courses in the college that students can learn. So the knowledge must be saved and retrieved whenever necessary. Here knowledge bank plays very important role. Following are some of the advantages of knowledge bank in education.

- 1) Knowledge bank will become knowledge asset of the organization.
- 2) Knowledge bank provides information to the staff which is helpful for the staff for teaching in the classroom.
- 3) Make the knowledge bank rich in content as the usage increases. As new staff members are adding knowledge to the knowledge bank the knowledge bank become rich and richer.
- 4) Knowledge Bank improves teacher efficiency. If teacher wants to teach the topic and he/she wants more information related to that topic then he/she can search in the knowledge bank and will get more information so that the teacher will teach the particular topic more efficiently.
- 5) Knowledge bank can be used by staff members, which will improve and accelerate learning.
- 6) Knowledge transfer from one person to another is better.
- 7) New knowledge which will be produced can be kept in knowledge bank so that whenever it is needed it is withdrawn from the knowledge banks.

## CONCLUSION

As we know KM is used to achieve objectives. The outcome of Education system is knowledge that student possess. If knowledge bank is used for knowledge sharing then it will increase an academic excellence.

## LIMITATIONS

The study will be restricted to only P.E. society's institute at college level. The design and interface will be completed in given time but the implementations will be partly done for studying the results of the knowledge management.

## SCOPE FOR FURTHER RESEARCH

All over the world companies are finding knowledge management is useful and advantageous which is successful leading to high performance. To start with KM initiative K-audit is firstly performed for successful management. In this paper we have not considered K-audit. So after considering K- Audit the performance of knowledge bank can also be improved. All over the world in education systems like universities does not have knowledge sharing across them. The knowledge generated in research activity is shared through thesis and research paper but there is no knowledge sharing across different universities at research level. Research activity which is currently going on is only guide and student and university knows. If any other fellow want to perform research on the same topic then he will never know who are performing research on the same topic currently. Another thing is there is no knowledge from placement point of view shared across universities and industries

## REFERENCES

1. Dennis A., Poothari S. and Natharajan V., 1996, 'Lessons from the early Adapters of Webgroupware', *Journal of Management Information systems*, Vol 14, No.4, pp65-86.
2. Gundry J. and Metes G, 1996, 'Team Knowledge Management: a Computer-Mediated Approach', Available from: [www.knoweb.co.uk/wbwtteam.html](http://www.knoweb.co.uk/wbwtteam.html)
3. Han J. & Kamber M, 2001, 'Data mining concepts and technologies', Morgan Kaufman Publishers.
4. Nickols, F. W., 2000. The knowledge in knowledge management. In Cortada, J.W. & Woods, J.A. (Eds) *The knowledge management yearbook 2000-2001* (pp. 12-21). Boston, MA: Butterworth-Heinemann.
5. Petrides L. & Nodine T., 2003, 'Knowledge management in education: Defining the Landscape', published by institute for the study of knowledge management in education. Available from: [www.iskme.org](http://www.iskme.org).
6. Scarbrough et al, 1999, 'Explicit and Tacit knowledge', Available from: [http://www.orsoc.org.uk/about/topic/projects/kmwebfiles/explicit\\_and\\_tacit.htm](http://www.orsoc.org.uk/about/topic/projects/kmwebfiles/explicit_and_tacit.htm)
7. <http://studygalaxy.com/ordinaryview.php?id=823>
8. Sun Microsystems, 2008, 'Java Server Pages Overview', J2EE, Available from: <http://java.sun.com/products/jsp/overview.html>
9. Webizus consulting, 2003, 'Knowledge management in educational institutions', Available from: <http://www.webizus.net/articles>.

## SOLVING TRAVELING SALESMAN PROBLEM BY DYNAMIC PROGRAMMING

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## ABSTRACT

In this paper, we show how to apply dynamic programming method solving traveling salesman problem to making managerial decisions in real world problems. As a numerical computation of traveling salesman problem, we considered 21 capital cities of each provinces of Mongolia. Due to a small number of entries (cities), we found the optimal path (an exact solution) to the problem. The optimal path has been described. It is concluded that the obtained result has a practical importance on decision making.

## KEYWORDS

Dynamic Programming, Managerial Decisions, Optimal Path, Traveling Salesman Problem.

## INTRODUCTION

There are many factors that impact managers to make effective and efficient decisions. One of them is to produce feasible solutions for an encountering problem, and choose the best among them one based on assessment.

Based on analysis of adequate observation and data, applications of mathematics provide terms that produce reasonable solutions to a problem. Mathematical methods are critical to making decisions in any sector. Thus, applications of probability theory, linear programming, and dynamic programming have been widely used as tools to produce effective and efficient solutions for business operation problems.

In this paper, we consider optimization theory applications in order to reach optimal or optimum managerial decisions. We first introduce the traveling salesman problem (TSP), which is the one of the most discussed classical optimization problems. Next, we formulate TSP in dynamic programming terms. Lastly, we provide some examples of dynamic programming applications in the real world scenarios in Mongolia.

## DYNAMIC PROGRAMMING FORMULATION

According to Bellman, the well-known traveling salesman problem is described as follows: "A salesman is required to visit once and only once each of  $n$  different cities starting from a base city, and returning to this city. What path minimizes the total distance travelled by the salesman?" (Bellman, R., 1953).

Assume the problem as a multistage decision problem. Since the salesman has to return to the city where he starts the tour, fix the origin at some city, say 0. Let say that at a certain stage of an optimal tour starting at 0 has reached a city  $i$  and there remain  $k$  cities  $j_1, j_2, \dots, j_k$  to 0.

Therefore, Bellman defines as:

$$f(i, j_1, j_2, \dots, j_k) \equiv \text{length of a path of minimum length from } i \text{ to } 0 \text{ which passes once and only once through each of the remaining } k \text{ unvisited cities } j_1, j_2, \dots, j_k. \quad (1)$$

Thus, if we obtain  $f(0; j_1, j_2, \dots, j_n)$ , and a path which has this length, the problem has been solved.

Let us also define  $d_{ij}$  to be the distance between the  $i^{\text{th}}$  and  $j^{\text{th}}$  cities. Then as a consequence of the above remarks, we have that

$$f(i; j_1, j_2, \dots, j_k) = \min_{1 \leq m \leq k} \{d_{ij_m} + f(i; j_1, j_2, \dots, j_{m-1}, j_{m+1}, \dots, j_k)\}. \quad (2)$$

This is an application of the general principle of optimality in the theory of dynamic programming.

The iterative procedure given by (2) is initiated through the use of the known function

$$f(i; j) = d_{ij} + d_{j0} \quad (3)$$

from which we obtain  $f(i; j_1, j_2)$ , which, in turn, through (2) yields  $f(i; j_1, j_2)$ , and so on until  $f(0; j_1, j_2, \dots, j_n)$  is obtained. The sequence of values of  $m$  which minimize the expression in the braces on the right-hand side of (2) gives a desired minimal path. (Bellman, R., 1953).

## FORMULATION OF TSP USING NETWORK FRAMEWORK

When making a mathematical formulation, it is easier to use network framework. Thus, we consider the cities as nodes, and the distances as arcs. (Rasmus, R., 2011). A standard assumption in TSP is to assume direct links between every pair of nodes, referred as a complete graph. A standard TSP always has a feasible solution since a complete graph is always connected, the optimal tour is closed, and all nodes are visited only once.

For the simplicity and its wide range of use we consider a standard TSP. The set of nodes to be visited are defined as  $N = \{1, 2, \dots, n\}$  where  $n$  is the total number of nodes (referred to as the size of a TSP), and the set of arcs connecting the nodes is defined as  $A = \{(i, j): i, j \in N, i \neq j\}$ , where the pair  $(i, j)$  indicates the arc between node  $i$  and  $j$ . The graph consisting of the nodes  $N$  and arcs  $A$  is then connected; there is a connection or path from any node to any other node in the graph. The basic standard assumption is to restrict the number of visits to exactly one for each node.

A common definition of the set of decision variables is  $X = \{x_{i,j}: i, j \in N, i \neq j\}$  where  $x_{i,j} = 1$  if the salesman travels from node  $i$  to  $j$  (node  $i$  is visited immediately before node  $j$ ), and 0 otherwise. The cost matrix is defined as  $C = \{c_{i,j}: i, j \in N, i \neq j\}$  and usually assumed to be positive, where  $c_{i,j}$  represents the cost of traveling from node  $i$  to node  $j$ . In standard TSP a common assumption is that the square cost matrix is symmetric,  $c_{i,j} = c_{j,i}$ , the cost is the same in both directions. Another standard assumption is to assume the triangle inequality;  $c_{i,j} + c_{j,k} \geq c_{i,k}$ ,  $\forall i, j, k \in N$ , the direct connection between two nodes is always the cheapest. A standard TSP could be formulated as following form:

$$\text{Minimize } \sum_{i=1}^n \sum_{j=1}^n c_{ij} x_{ij} \quad (1)$$

$$\sum_{i=1}^n x_{ij} = 1, \forall j \in N \quad (2)$$

$$\sum_{j=1}^n x_{ij} = 1, \forall i \in N \quad (3)$$

$$x_{ij} \in \{0,1\}, \forall i, j \in N \quad (4)$$

In addition subtour elimination constraints are needed. Constraints (2) and (3) are the standard assignment constraints. The objective in (1) will minimize the total cost along all the arcs used to complete the tour. However, as written this formulation assumes a complete graph, and if the data are being arranged in a square matrix will also include the diagonal. For a complete graph the only arcs that do not exist are related to the self-loop variable  $x_{ij}$  (along the diagonal). Therefore it usually is more convenient to exclude these variables by a new constraint (5), instead of excluding them in the definition of the set  $X$ . This convenience comes at the cost of increased problem size (both in terms of variables and constraints). For a complete graph the following constraint will fix the diagonal in a square  $n$  matrix of the binary variables  $x_{ij}$  equal to zero:

$$x_{i,i} = 0, i \in N \quad (5)$$

## NUMERICAL COMPUTATIONS

As an example of a TSP in a complete graph we used following examples. A traveling salesman is visiting capital cities of each provinces of Mongolia. The base is starting from Ulaanbaatar city, the capital of Mongolia. We computed this problem using Rasmussen's method on Excel Solver Premium. Data (see appendix Table-1) on distances between the cities is taken from National Statistical Office. In order to solve the problem, we indexed the cities in Table-2 (see appendix).

The total number of feasible solutions is

$$(n - 1)! = (22 - 1)! = 21! = 51,090,942,171,709,400,000$$

And, the optimal solution to the problem is as follows (see appendix Table-2)

**The Optimal Route:** Ulaanbaatar-Sukhbaatar-Darkhan-Erdenet-Bulgan-Murun-Ulyastai-Ulaangom-Ulgii-Khovd-Altai-Bayakhongor-Tsetserleg-Arvaikheer-Dalanzadgad-Mandalgovi-Choir-Sainshand-Baruun Urt-Choibalsan-Undurkhaan-Zuunmod-Ulaanbaatar

**Total distance:** 6,030 км

On the other hands, a traveling salesman would travel the shortest path of 6,030 km if he follows the above optimal route. This result could be used as one of the alternatives to minimize the cost and time resulting better decision making for managers.

## CONCLUSION

Decision making is critical component of business. Some decisions are obvious and can be made quickly, without investing much time and effort in the decision-making process. Others, however, require substantial consideration of the circumstances surrounding the decision, available alternatives, and potential outcomes. Fortunately, there are mathematical methods such as applications of probability theory, linear programming, and dynamic programming that can be utilized to assess the substantial consideration circumstances and produce effective and efficient solutions. We applied dynamic programming method for solving a TSP formulated for cities of each provinces of Mongolia. The obtained result has a practical importance.

## REFERENCES

1. Bellman, R. 1954, "The Theory of Dynamic Programming", RAND Corporation, Available at: <http://www.rand.org/pubs/papers/P550>.
2. Dondald, D. 2010, "Traveling Salesman Problem: an Overview of Applications, Formulations, and Solution Approaches" in Traveling Salesman Problem, Theory and Applications, Ch 1, pp 1-24, InTech, New York.
3. Harlan. C. 2000, "The science of smart decisions: Making operations research core business competency", *ORMS today*, Jun 2000, Available at: <http://www.orms-today.org/orms-6-00/crowder.html>
4. Rasmussen, R. 2010. "TSP in Spreadsheets-A Guided Tour", *International Review of Economic Education*, 2011, vol. 10, issue 1, pp 94-116.

APPENDIX

TABLE-1 (NATIONAL STATISTICAL OFFICE 2011 BULLETIN)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
2	0	0	477	1709	639	336	1037	450	661	275	1023	431	575	565	321	1487	779	338	43	1417	223	373	223
3	1	477	0	1085	191	282	589	927	1138	752	546	255	634	1042	617	1039	379	815	520	940	519	338	700
4	2	1709	1085	0	1070	1367	672	2159	2370	1579	725	1278	1657	2274	1702	222	928	2047	1752	291	1604	1423	1766
5	3	639	191	1070	0	473	398	853	1300	509	470	208	500	1204	808	848	570	977	682	1131	862	529	696
6	4	336	282	1367	473	0	871	776	997	611	828	364	743	901	335	1321	348	674	379	1026	240	59	559
7	5	1037	589	672	398	871	0	1286	1698	907	195	606	898	1602	1358	450	585	1375	1080	693	1260	927	1094
8	6	450	927	2159	853	776	1286	0	520	344	1423	645	499	334	771	1937	1229	302	430	1867	673	823	226
9	7	661	1138	2370	1300	997	1698	520	0	736	1694	1092	1031	193	982	2148	1440	323	704	2078	884	1034	439
10	8	275	752	1579	509	611	907	344	736	0	979	301	300	664	596	1357	1054	417	232	1692	498	648	187
11	9	1023	546	725	470	828	195	1423	1694	979	0	678	970	1588	1163	503	390	1361	1066	529	1065	884	1246
12	10	431	255	1278	208	364	606	645	1092	301	678	0	379	996	752	1056	634	769	474	1695	654	635	664
13	11	575	634	1657	500	743	898	499	1031	300	970	379	0	839	896	1348	1354	717	717	1992	798	948	480
14	12	565	1042	2274	1204	901	1602	334	193	664	1588	996	839	0	886	2052	1344	227	566	1982	788	938	477
15	13	321	617	1702	808	335	1358	771	982	596	1163	752	896	886	0	1808	683	659	407	1361	98	279	544
16	14	1487	1039	222	848	1321	450	1937	2148	1357	503	1056	1348	2052	1808	0	893	1825	1530	243	1710	1380	1710
17	15	779	379	928	570	348	585	1229	1440	1054	390	634	1354	1344	683	893	0	1117	822	678	588	407	1002
18	16	338	815	2047	977	674	1375	302	323	417	1361	769	717	227	659	1825	1117	0	313	1755	561	711	235
19	17	43	520	1752	682	379	1080	430	704	232	1066	474	717	566	407	1530	822	313	0	1460	266	416	204
20	18	1417	940	291	1131	1026	693	1867	2078	1692	529	1695	1992	1982	1361	243	678	1755	1460	0	1266	1085	640
21	19	223	519	1604	862	240	1260	673	884	498	1065	654	798	788	98	1710	588	561	266	1266	0	180	446
22	20	373	338	1423	529	59	927	823	1034	648	884	635	948	938	279	1380	407	711	416	1085	180	0	596
23	21	223	700	1766	696	559	1094	226	439	187	1246	664	480	477	544	1710	1002	235	204	640	446	596	0

TABLE-2

	A	B	C	D	E	F	G	H
25		Sequence	Distance	Sequence	City names		Index	City names
26		0	0	1	Ulaanbaatar		0	Ulaanbaatar
27		13	321	2	Sukhbaatar		1	Tsetserleg
28		19	98	3	Darkhan		2	Ulgii
29		20	180	4	Erdenet		3	Bayankhongor
30		4	59	5	Bulgan		4	Bulgan
31		15	348	6	Murun		5	Altai
32		9	390	7	Uliastai		6	Sainshand
33		18	529	8	Ulaangom		7	Choibalsan
34		2	291	9	Ulgii		8	Mandalgovi
35		14	222	10	Khovd		9	Uliastai
36		5	450	11	Altai		10	Arvaikheer
37		3	398	12	Bayankhongor		11	Dalanzadgad
38		1	191	13	Tsetserleg		12	Baruun Urt
39		10	255	14	Arvaikheer		13	Sukhbaatar
40		11	379	15	Dalanzadgad		14	Khovd
41		8	300	16	Mandalgovi		15	Murun
42		21	187	17	Choir		16	Undurkhaan
43		6	226	18	Sainshand		17	Zuunmod
44		12	334	19	Baruun Urt		18	Ulaangom
45		7	193	20	Choibalsan		19	Darkhan
46		16	323	21	Undurkhaan		20	Erdenet
47		17	313	22	Zuunmod		21	Choir
48		0	43	23	Ulaanbaatar			
49		Total	6030					

## EMPIRICAL STUDY ON PARENTAL PERCEPTION TOWARDS THE IMPACT OF ADVERTISING ON CHILDREN OF PUNJAB

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### ABSTRACT

The study on "Parental perception on the impact of advertising on the children of Punjab" was conducted to find out the parental perception about the impact of T.V advertisements on children and to find out the factor influencing children purchase decision. The study was carried out in Jalandhar, Phagwara and Ludhiana cities of Punjab, a state of North India, using a sample size of 100 parents and the data was collected through a structured questionnaire. It demonstrates that children demand more of the product whose advertisements they like. Parents believe that television advertisements are affecting the study of children, making them more violent and stubborn. Children start copying from the advertisements and indulge in bad habits. They have negative impact on children since they demand, nag and pester their parents to purchase the advertised product. Television advertisements are an important factor which drives their product choice and inculcate unhealthy eating habits in them.

### KEYWORDS

advertising, Kids, change in behaviour.

### INTRODUCTION

In India television has come up in a huge way and advertising is a huge multimillion dollar industry that has an enormous impact on the development of a child. Parents believe that there is change in the pattern and behavior of children when they watch television advertisements. Television advertisements have a negative impact on children since whenever they come across an advertisement, they demand, nag and pester their parents to purchase the advertised products. Refusal of such requests often results in conflict and deteriorates parent's relationship with their children. They think that children need some kind of protection from advertisement; otherwise they will exploit their credulity and loyalty. For this reason, countries like Norway has introduced a total ban on television advertising directed at children. In Sweden, television advertisements are banned for children below the age of 12 years. Australia does not allow advertisements on television during programs for pre-scholars. Countries like Greece have proclaimed a partial ban on advertisements prohibiting toy advertising between 7am and 7 pm.

### OBJECTIVES OF THE STUDY

- ❖ To find out the parental perception about the impact of T.V advertisements on children.
- ❖ To find out the factors influencing children purchase decision.

### LITERATURE REVIEW

**Darian C Jean, (1998)**, This research has analyzed the in-store behaviour of children and their parents while shopping for children's clothing. Data was collected by unobtrusively observing and recording the behavior of parents and children in retail stores. Results indicate that a purchase was more likely where both parties were highly involved in the search, the interaction was collaborative, the parent had positive evaluations of quality, price, practicality and style, the child had positive evaluations of price, style and colour, and the salesperson addressed the needs of both the parent and the child. It is recommended that retailers' strategies for merchandise selection, sales force training and in-store promotions, address the needs of both parent and child. **McNeal, U.James, Ji.F.Mind, (1999)**, The research has reported that Chinese children as consumers learn information about new products and their attitudes toward different sources of information. Chinese children's usage of the mass media was also examined, as was the relationship between mass media usage and information sources. The findings show that Chinese children utilize a wide variety of information sources to learn about new products including parents, retail outlets, and the mass media, and surprisingly they consider the newest medium, television, to be the most important of all. The effects of gender, age and family occupation were also considered. **Grant.J.Isabel, Stephen.R.Graeme, (2005)**, has examined the key communicating factors which influence 12-13 year old girls in their purchasing decisions for fashion clothing. A series of four, structured focus group interviews, consisting of six girls, with questions developed after analysing the available literature. A qualitative method of data analysis was conducted based around five related themes and the "reflective stage", 11-16 years. The findings show the key decision factors when buying are parental and peer group approval, and the purchasing of fashion items is strongly influenced by brand name and its associations. The findings revealed the respondents were prepared to pay a premium for branded clothing, placing a high emphasis on the product being deemed cool. **Panwar,J.S.&Vidyanagar,Vallabh &Agnihotri,Milan(2006)**, This study was designed to extend knowledge of cognitive processing of advertising messages by urban children in India. Data was collected from 250 children aged between 7 and 12 years. It was found that children's ability to decode and process advertising messages and to understand their intents is influenced not only by their cognitive abilities at different age strata but also by their social and personal environments. Social norms related to acceptability and appropriateness of gender behaviour also influence the processing of ad messages by the children of both sexes. Other elements like likeability of the model, character or endorser, story line, slogan and the music will create liking or disliking for a particular advertisement and hence decoding of its message. **Shoham.Aviv,Dalakas.Vassilis(2006)**, The purpose of this paper is to examine the influence tactics used by adolescent children and parental yielding to these tactics outside North America. The findings indicate that Israeli adolescents use rational tactics more often than emotional tactics for both products. Parental yielding follows the same pattern – it is highest for rational tactics and lowest for emotional tactics for both products. **Mittal.Manish, (2008)**, the purpose of this paper was to gain knowledge will be helpful in designing the promotional strategy to reach the most prominent decision maker in viewing habits of Indian children primary data was collected from 171 respondents of age group of 4-6 from private schools. The research indicates that kids channel is more popular among kids. **Vernebar, S. Sachin ,Wadha, Preety,(2008)** this research has analyzed the area of expenditure by their parents for their children, shows children are analyzing brands and logos, and to explore what kind of ads are liked by kids. Descriptive research is used for kids while exploratory research for parents and data was collected using survey method, and the research tools used were structured questionnaire, the sample design was selected through non probability purposive sampling, sample size 180 respondents, in which 30 girls, 30 boys and rest of 120 were parents across their different age categories and their findings were that children influence on the purchasing decision in household in extensive and on cross which might be attributed to rising disposable income on one brand and increasing effect of advertising on children on the other. **Agrawal, Noopur, Tripathi prabash, Aditya,(2008)** has analyzed the impact of television advertising on children's food preference with special reference to Delhi NCR collected data from 300 respondents in the age group of 6-16 years, Convenience based sampling was adopted and the major findings were TV ads are still the most popular media to reach kids but online ads have also created buzz, at least it come out that TV ads have positive influence on the food preference of kids in Indian prospective. **Mohideen.A.K,(2009)** has analyzed the ethical value of advertising in print electronic media. A structured questionnaire was used to collect the primary data random sample of 150 respondents between the age group of 18 to 35 years various professions were taken. The findings of this study indicate that even those

who use the brand feels its advertisement are unethical. **Bridges, Drobe, Erin, Burgess, Brigitte, (2009)** has analyzed a group of consumers referred to as "tween" a sub group of generation Y, described as pre-adolescents, aged 9-15 years who are between the children and junior markets, by taking previously tested measures and applying them to "tween" girls. The first section of the survey included demographic items consisting of twin's age, grade level and race future research should replicate or adopt the study a larger sample in order to determine the strengths of relationships since the majority of respondents were between the age group of 12-15. **Fan Ying, Li Yixuan (2009)**, The purpose of this paper was to report an empirical study on children's buying behaviour in China, with a special focus on their information sources. Primary data were collected from a sample of 155 children aged ten-13 using questionnaire survey. Various statistical methods such as Pearson correlation and tests were employed to analyse the data. Chinese children regard television commercials as an important information source for new products. However, they place greater level of trust in interpersonal information sources, especially in their parents who are perceived as the most credible information source with respect to their learning about new food products. **Bridges Drake Erin , Burgess Brigitte (2009)**, This paper has analyzed and thrown light on the behaviors of a group of consumers referred to as "tween", a sub-group of Generation Y, described as pre-adolescents, aged 9 to 15, who are between the children and juniors markets, by taking previously tested measures and applying them to "tween" girls. The first section of the survey included demographic items consisting of tweens' age, grade level and race. Future research should replicate or adapt the study to a larger sample in order to determine the strength of the relationships, since the majority of the respondents were between the ages of 12 to 15, leaving younger tweens under-represented. **Priya Pankaj , Baisya Rajat Kanti and Sharma Seema (2009)**, The paper analyzed the impact of children's attitudes towards television advertisements on their resultant buying behaviour. The research has been based on exploratory and descriptive research design. The demand for the advertised products is heavily influenced by the children's attitude towards advertisements. **Jam Ahmed Farooq, Akhtar Shakeel, Tahir Hijazi Syed, et.al (2010)** has analyzed the Impact of marketing activities (specially advertising) on children is very important and sensitive issue for the society and marketers. We explored with sample from 07 different schools 330 children and 107 parents to come up with practical insight of advertising influence on children memory and behavior in Pakistani context. Our results showed interesting findings that ads do not impact negatively to children memory and behaviour. **Pandey Akhilesh Chandra, Singh Aniruddh (2010)**, has analyzed the Response to advertisement , general Media habits of the Consumers , factors of maximum impact on purchase decision, the relationship between watching TV and likelihood of advertisement. The findings shows that there is significant relationship between watching T.V and liking of advertisement seen on the T.V., About 92% respondents agreed that they watch TV one to two hours every day .

## RESEARCH METHODOLOGY

QUANTITATIVE RESEARCH was done for the study because aim was to gather an in depth understanding of human behaviour and the reason that govern such behaviour. The target population is parents having at least 1 child within the age group of minimum 2 years and maximum 16 years of Jalandhar, Phagwara, Ludhiana and Punjab. The sample size of the study surveyed 100 parents. Non probability sampling technique is used. Further quota sampling is used because only 100 parents having at least 1 child within the age group of minimum 2 years and maximum 16 years are taken. Primary data is been collected from the parents with the help of structured questionnaire which will include close and open ended questions. Secondary data is been collected from journals as well as magazines, newspapers and different websites.

## INTERPRETATION

(From table 1 KMO value is 0.799, which is greater than 0.5 and this shows that the sample is adequate.)

The final statistics comprises the communality for all 15 variables and the Eigen value of all factors which have Eigen value of 1

The first step in interpreting the output is to look at the factor extracted. The Eigen value table states that there are 4 factors which have Eigen value of 1. The last column in the table 3 shows that the 4 factors extracted together account for 58.39% of the total variance. In this 4 factors (reducing them from 15) have lost only 41.61% of the information content, while 58.39% is retained by the 4 factors extracted out of the 15 variables. Looking at rotated component matrix in table-4 that variable no.'s 11, 13, 14 and 15, have loading of 0.700, 0.748, 0.661 and 0.763 respectively. This suggests that factor 1 is a combination of these 4 original variables; which are:

- 1). Effects the study of the children
- 2). Children become more violent
- 3). Children behaviour becomes Stubborn
- 4) Children start copying from the advertisements and indulge in bad habits

In this case factor 1 could be named as **negative impact of advertisement.**

Now looking at factor 2 In rotated component matrix (table 4) in second column, variable no. 2,7, and 10 have loading of 0.749, 0.784 and 0.618 respectively. This tells that factor 2 is a combination of these 3 original variables; which are:

- 1). Any specific toy or gift attached with the product impules the child to purchase the product
- 2) Impulses children to change their preference towards a specific product
- 3) Effect children's health or fooding habits as most of the food commercials aimed at children

In this case factor 2 could be named as **shift in demand towards various products.**

Looking at rotated component matrix (table-4) in third column, we notice that variable no. 5 and 9 have loading of 0.819 and 0.659 respectively. This suggests that factor 3 is a combination of these 2 original variables; which are:

- 1). Children get easily influenced by cartoon characters shown in advertisement
- 2). When children visit shopping mall, forcibly demand the product

In this case factor 3 could be named as **influenced by advertisement.**

Looking at rotated component matrix (table-4) in fourth column, we notice that variable no.1 and 4 have loading of 0.778 and 0.824 respectively. This suggests that factor 4 is a combination of these 2 original variables; which are:

- 1). Advertisement enhances the knowledge of children
- 2) Enables Logical thinking of your child.

In this case factor 4 could be named **enhances analytical skills of child.**

## FINDINGS

The findings for parental perception about the television watching habits that highly effects their children is shown in column 1 of rotated component matrix (table 4) shows that advertisements are having **negative impact on children.** Advertisements effect the study of the children as they watch more television, they are also becoming more violent and their behaviour becomes Stubborn due to the kind of advertisements shown. Children start copying from the advertisements and indulge in bad habits. There is a **shift in demand towards various products.** Any specific toy or gift attached with the product impules the child to purchase the product, advertisements also impules children to change their preference towards a specific product and it also effect children's health or fooding habits as most of the food commercials aimed at children & get **influenced by advertisement.** Children's are getting easily influenced by cartoon characters shown in advertisement and when children visit shopping mall they forcibly demand the product that they see in advertisement. It has been found out that advertisement **enhances the knowledge of children** and enables logical thinking among them.

## LIMITATIONS

The limitations of the study are:-

- ❖ As the study had limited time to complete my research so there is a boundation of time constraint in my study.

❖ There are some limitations of study regarding sample selection because entire sample is taken from only three cities of Punjab so it may not be the true representative of population , Life style, economic condition and per capita income of that area might have some influence on the community in sample.

**CONCLUSION**

The study was started with the aim to explore the role of advertisement in influencing the behavior of children and the findings provided astonishing insights for future researchers and marketing managers. It has been concluded that ads didn't help buying behavior but children insist on buying things they like while shopping with their parents. And the reason for this insistence was proved to be personal not the impact of advertising. We find mix results that they try to copy the ads, and parents rejected the notion that ads negatively impact the behavior of their children, while they were agree in majority that ads enhance the knowledge of their children. We discussed several key insights for practitioners and future researchers. The study has a great importance for marketers involved in positioning and advertisement and will definitely add value in marketing literature regarding impact of marketing practices on society especially on children.

**REFERENCES**

1. **Agrawal, Noopur, Tripathi prabash, Aditya,(2008)** , A study of the impact of Television Advertising on Children's Food Preference, Indian journal of marketing june,2008.
2. **Bridges Drake Erin ,Burgess Brigitte (2009)**, Personal preferences of tween shoppers, Journal of Fashion Marketing and Management Vol. 14 No. 4, 2010 pp. 624-633
3. **Darian C Jean. (1998)**, Parent-child decision making in children's clothing stores, International Journal of Retail & Distribution Management ,Volume 26 · Number 11 · 1998 · 421-428.
4. **Fan Ying,Li Yixuan (2009)**, Children's buying behaviour in China A study of their information sources ,Marketing Intelligence & Planning Vol. 28 No. 2, 2010 pp. 170-187
5. **Grant J Isabel , Stephen R.Graeme (2005)**, Buying behaviour of "tweenage" girls and key societal communicating factors influencing their purchasing of fashion clothing. Journal of Fashion Marketing and Management Vol. 9 No. 4, 2005 pp. 450-467
6. **Jam Ahmed Farooq, Akhtar Shakeel, Tahir Hijazi Syed,et.al(2010)**, Impact of Advertisement on Children Behavior: Evidence from Pakistan European Journal of Social Sciences –Volume 12, Number 4 (2010)
7. **McNeal U James, Ji F .Mind(1999)**, Chinese children as consumers: an analysis of their new product information sources, JOURNAL OF CONSUMER MARKETING, VOL. 16 NO. 4 1999, pp. 345-364,
8. **Mittal Manish, (2008)**, "lecturer" of Daly College of business school in Indore: Television viewing behaviour among India kids. Indian journal of marketing July, 2008 Dally college campus Indore (MP)-452001.
9. **Mohideen, A.K.,(2009)** "associate professor" Vishwandha business School, Visakhapatnam, Andhra Pradesh: A study on ethical values of advertising in print and Electronic Media, Indian journal of marketing, December, 2009
10. **Pandey Akhilesh Chandra, Singh Aniruddh (2010)**, "Passive Dictators" of the family and Consumer Behaviour: A Case of malted food, International Trade & Academic Research Conference (ITARC) - London 2010
11. **Panwar,J.S.&Vidyanagar,Vallabh&Agnihotri,Milan,(2006)**, Advertising message processing amongst urban children An Indian experience — with special reference to TV advertising, Asia Pacific Journal of Marketing and Logistics, Emerald Group Publishing Limited,vol (18), issue 4, pg no 303-327.
12. **Priya Pankaj , Baisya Rajat Kanti and Sharma Seema (2009)**, Television advertisements and children's buying behaviour, Marketing Intelligence & Planning Vol. 28 No. 2, 2010 pp. 151-169.
13. **Shoham Aviv, Dalakas Vassilis(2006)**, How our adolescent children influence us as parents to yield to their purchase requests, Journal of Consumer Marketing 23/6 (2006) 344-350.
14. **Vernebar, S. Sachin ,Wadha, Preety,(2008)** "lecturer and director" of Bharati Vidyapeeth University, Institute of management and research, new Delhi-110063: Kids mean business – Marketers beware! A market survey on impact of advertising on kids, Indian journal of marketing, August,2008

**ANNEXURE  
FACTOR ANALYSIS**

**TABLE 1: KMO AND BARTLETT'S TEST**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.799
Bartlett's Test of Sphericity	Approx. Chi-Square	413.632
	Df	105
	Sig.	.000

My KMO value is 0.799, which is greater than 0.5 and this shows that my sample is adequate. So I can go ahead with factor analysis.

COMMUNALITIES		
	Initial	Extraction
Advertisement enhance the knowledge of children	1.000	.619
Any specific toy or gift attached with the product impules the child to purchase the product	1.000	.626
Increases excitement level of children	1.000	.591
Enables Logical thinking of your child.	1.000	.706
Children get easily influenced by cartoon characters shown in advertisement	1.000	.710
Children get easily influenced by celebrety endorsement or children endorsing the product	1.000	.300
impules children to change their preference towards a specific product	1.000	.686
depiction of culture , of any country or society.	1.000	.420
When children visit shopping mall , they forcibly demand the product	1.000	.622
Effect children's health or fooding habits as most of the food commercials aimed at children	1.000	.576
effects the study of the children	1.000	.622
effect the lifestyle as they try to imitate as their icon in advertisement	1.000	.477
Children becomes more violent	1.000	.625
children behaviour becomes Stubborn	1.000	.579
Children start copying from the advertisements and indulge in bad habits	1.000	.602

**TABLE-2: TOTAL VARIANCE EXPLAINED**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.651	31.008	31.008	4.651	31.008	31.008	2.698	17.990	17.990
2	1.530	10.201	41.209	1.530	10.201	41.209	2.220	14.798	32.788
3	1.455	9.702	50.910	1.455	9.702	50.910	1.963	13.087	45.875
4	1.123	7.487	58.398	1.123	7.487	58.398	1.878	12.522	58.398
5	.908	6.051	64.449						
6	.852	5.677	70.126						
7	.718	4.789	74.915						
8	.678	4.522	79.437						
9	.598	3.986	83.422						
10	.523	3.487	86.910						
11	.479	3.193	90.103						
12	.426	2.843	92.946						
13	.412	2.748	95.694						
14	.368	2.452	98.146						
15	.278	1.854	100.000						

Extraction Method: Principal Component Analysis.

**TABLE-3: COMPONENT MATRIX<sup>a</sup>**

	Component			
	1	2	3	4
Advertisement enhance the knowledge of children	.274	.220	.693	.122
Any specific toy or gift attached with the product impules the child to purchase the product	.472	.347	-.393	-.358
Increases excitement level of children	.637	-.096	-.041	.417
Enables Logical thinking of your child.	.427	.143	.706	-.073
Children get easily influenced by cartoon characters shown in advertisement	.517	.238	-.302	.542
Children get easily influenced by celebrety endorsement or children endorsing the product	.490	.083	.229	.002
impules children to change their preference towards a specific product	.576	.115	-.107	-.574
depiction of culture , of any country or society.	.602	.175	.141	-.081
When children visit shopping mall , they forcibly demand the product	.455	.594	-.087	.233
Effect children’s health or fooding habits as most of the food commercials aimed at children	.693	.217	-.073	-.209
effects the study of the children	.565	-.475	.240	-.138
effect the lifestyle as they try to imitate as their icon in advertisement	.649	.124	-.185	.080
Children becomes more violent	.643	-.435	-.025	.147
children behaviour becomes Stubborn	.645	-.342	-.171	-.128
Children start copying from the advertisements and indulge in bad habits	.552	-.526	-.104	.094
Extraction Method: Principal Component Analysis.				
a. 4 components extracted.				

**TABLE-4: ROTATED COMPONENT MATRIX<sup>a</sup>**

	Component			
	1	2	3	4
Advertisement enhance the knowledge of children	-.023	-.069	.095	.778
Any specific toy or gift attached with the product impules the child to purchase the product	.005	.749	.232	-.104
Increases excitement level of children	.498	.027	.558	.175
Enables Logical thinking of your child.	.117	.116	-.011	.824
Children get easily influenced by cartoon characters shown in advertisement	.182	.078	.819	-.023
Children get easily influenced by celebrety endorsement or children endorsing the product	.226	.221	.191	.404
impules children to change their preference towards a specific product	.224	.784	-.064	.133
depiction of culture , of any country or society.	.220	.400	.250	.386
When children visit shopping mall , they forcibly demand the product	-.168	.325	.659	.231
Effect children's health or fooding habits as most of the food commercials aimed at children	.242	.618	.284	.234
effects the study of the children	.700	.152	-.122	.306
effect the lifestyle as they try to imitate as their icon in advertisement	.313	.393	.463	.099
Children becomes more violent	.748	.090	.214	.108
children behaviour becomes Stubborn	.661	.362	.105	-.004
Children start copying from the advertisements and indulge in bad habits	.763	.069	.120	-.018
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				

**TABLE-5: COMPONENT TRANSFORMATION MATRIX**

Component	1	2	3	4
1	.612	.535	.455	.362
2	-.786	.366	.437	.239
3	-.039	-.305	-.306	.901
4	.075	-.698	.713	.010

**TABLE-6: COMPONENT SCORE COEFFICIENT MATRIX**

	Component			
	1	2	3	4
Advertisement enhance the knowledge of children	-.087	-.137	.021	.486
Any specific toy or gift attached with the product impules the child to purchase the product	-.129	.442	.001	-.156
Increases excitement level of children	.162	-.200	.308	.013
Enables Logical thinking of your child.	-.041	-.019	-.112	.492
Children get easily influenced by cartoon characters shown in advertisement	-.010	-.157	.526	-.105
Children get easily influenced by celebrety endorsement or children endorsing the product	.016	.027	.025	.193
impules children to change their preference towards a specific product	-.019	.473	-.253	-.009
depiction of culture , of any country or society.	-.020	.132	.028	.161
When children visit shopping mall , they forcibly demand the product	-.228	.068	.380	.076
Effect children's health or fooding habits as most of the food commercials aimed at children	-.032	.277	.013	.040
effects the study of the children	.303	-.013	-.218	.117
effect the lifestyle as they try to imitate as their icon in advertisement	.032	.093	.188	-.044
Children becomes more violent	.319	-.116	.037	-.032
children behaviour becomes Stubborn	.257	.108	-.080	-.110
Children start copying from the advertisements and indulge in bad habits	.352	-.099	-.015	-.102
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Component Scores.				

**TABLE-7: COMPONENT SCORE COVARIANCE MATRIX**

Component	1	2	3	4
1	1.000	.000	.000	.000
2	.000	1.000	.000	.000
3	.000	.000	1.000	.000
4	.000	.000	.000	1.000
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Component Scores.				

**STUDIES ON WEB BASED MANAGEMENT SYSTEM USING LOAD BALANCING SYSTEM**

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**ABSTRACT**

The internet has experienced a near exponential growth in user base, infrastructure, content size and resources like low-latency, high throughput network links. According to the internet world stats initiative, Internet users now total over one billion – approximately 16 percent of the world's population. This explosive increase means that high traffic sites offering e-commerce, community and other resource intensive services, face an enormous challenge when it comes to ensuring high availability and fault tolerance for their services. This paper examines how load balancing is used as a central concept to achieve these goals and interoperability with existing technology. A structured approach to high availability and fault tolerance is essential in a production-grade service delivery network, where delays and faults can occur for a multitude of reasons. In this paper, we consider the high level scheduling and load balancing properties offered by the Domain System, as implemented in popular DNS software packages. At this level, the scheduling mechanism can account for server availability, geographical proximity, time zones, etc. We explore the performance and capabilities of high-level DNS-based load balancing, where we draw special attention to the choice of caching policy (time-to-live) for DNS data. Our findings confirm the high performance of modern DNS server implementations, but question the use of DNS as a suitable load balancing mechanism in itself. Further, we analyze the use of a database-supported DNS service for allowing highly dynamic query responses, and show that this approach has both potentially negative (single point of failure) and positive (improved balancing flexibility) properties.

**KEYWORDS**

Quality of Service, DNS, Load balancing, Load buffer, Caching.

**1. INTRODUCTION**

In recent years, the number of people using internet services has grown dramatically due to rapid development of the Internet. To cope with the increasing user demand, it becomes a common practice nowadays to use multiple web servers to process user requests in parallel. However, if the user requests cannot be spread among web servers evenly such that some servers become overloaded while the others remain idle, the overall web server's utilization will be dropped, resulting in poor and unstable quality of service for the whole system.

This uneven server load problem has been addressed by many researchers over the years. [1] Classifies existing load balancing architecture into four classes, namely client-based, dispatcher-based [5], DNS-based [7] and server-based [3] [4] [8] load balancing architecture. In this paper we focus on the DNS-based load balancing architecture. In such architecture, web servers are usually placed in geographically decentralized areas, and a Domain Name Server (DNS) acts as a request dispatcher that dispatches requests to web servers. The advantage of this approach is that by considering the geographical relation between a client and each web server, the DNS can assign a web server with lower propagation delay to that client to provide better quality of service. In order to achieve load balancing, the DNS typically uses Round Robin scheduling to map different clients to different web servers in a logical cluster. [10] Showed that the classic algorithms, such as Round Robin, are not adequate for the DNS scheduler. To improve the load imbalance issue, [7] proposed an adaptive time-to-live (TTL) policy in DNS-based architecture which assigns a different TTL value to each address based on client request rates. To resolve the issue of uneven domain load distribution, requests coming from popular domain load distribution, requests coming from popular domains will receive a lower TTL. In a dynamic environment, the algorithms using the detailed load information from the servers can achieve better load balancing, but at the cost of extra computation and communication. Unlike a traditional parallel/distributed system, web servers are geographically distributed, and the DNS cannot obtain their states too often to avoid network congestion and bandwidth waste. Therefore, a method that uses asynchronous feedback alarms and required only limited state information from the overloaded servers had been proved more effective than those that use periodic feedback information from every server to make scheduling decision [10].

A conventional asynchronous feedback method for DNS-based load balancing architecture often sets a so-called *load buffer range* with low and high thresholds to decrease the state change frequency of a web server. If the load of a web server exceeds the high threshold, an overload alarm signal will be sent back to the DNS. DNS will then exclude this web server from further assignments of new requests. This web server will remain in an overloaded state until its utilization drops under the low threshold, then another asynchronous message will be sent to the DNS. The DNS will resume assigning the requests to the web server. Without care, however, setting the load buffer range improperly may result in load oscillation among web servers. To address this problem, we propose a random early detection (RED) method with the intuition that the probability for a web server to become overloaded in the near future is directly proportional to its current load.

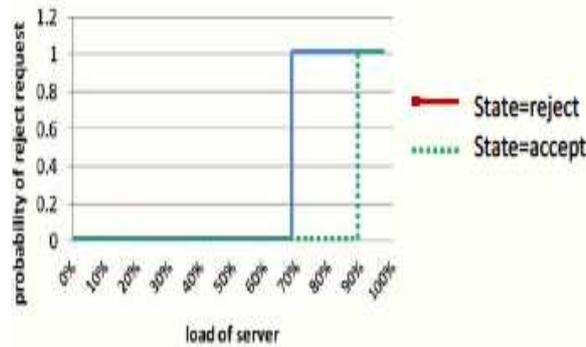
In this paper we are concerned with Distributed web-server system, DNS based load balancing architecture, load buffer range method and random early detection method.

**2. DISTRIBUTED WEB-SERVER SYSTEM**

The web server system architecture consists of three entities: the client, the domain name server (DNS) and the web server. The distributed web-server system can be organized into several web servers and a cluster DNS that resolves all initial address resolution requests from local gateways. Each client session can be characterized by one address resolution and several web page requests. At first, the client receives the address of one web-server of the cluster through the DNS address resolution. Subsequently, the client submits several HTTP requests to the web-server. In addition to resolving the URL-name to the IP address of a web server, the DNS of a distributed web-server system can collect information from web-servers for various statistics [11]. The DNS can select the address of a web-server based on the collected information. In order to select the address of a suitable web-server, the DNS could use some scheduling policy to balance the load among several web-servers to avoid becoming overloaded.

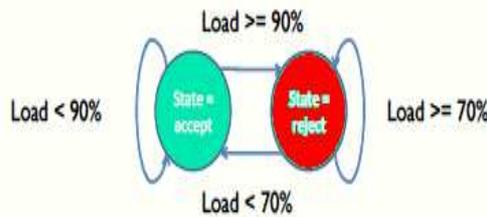


FIG. 3: SHOWS THE STATE TRANSITION DIAGRAM OF THE LBR EXAMPLE



In fig.3, before the load of a web server exceeds 90% (high threshold), the server is not overloaded. That is, the DNS server can assign new client requests to that web server. Once the load of that web server is greater than 90%, it enters into the overloaded state. A web server in overloaded state notifies the DNS server not to assign new client requests to that web server until its utilization return under 70% (low threshold).

FIG.4 STATE CHANGE OF CONVENTIONAL LBR METHOD

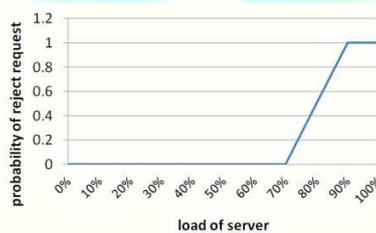


This probability of the overloaded state against to the server load is shown in Fig4. In this method, when there are not many service servers and the amount of requests is high, once one of the service servers is overloaded, it must keep its overloaded state until its load is under 70% and then notify DNS server to assign new client requests to that web server. During this period, the other web servers may need to share the additional 20% (90%-70%) load from that overloaded server. This may in turn cause other web servers to become overloaded, and so on, resulting in unstable service quality.

**5. RANDOM EARLY DETECTION METHOD:**

For solving the load oscillation phenomenon of web servers mentioned previously, we consider that the state of overload or under-load of a web server in the load buffer range should be a probability rather than definite, in order to avoid burdening the other web servers with too much load. Hence, we use the concept of random early detection (RED) method to determine the overload status of web servers probabilistically. The RED idea is first presented in [9] for congestion avoidance in packet-switched networks. When the average queue size exceeds a preset threshold, the gateway drops or marks each arriving packet with a certain probability, where the probability is a function of the average queue length. It puts emphasis on avoiding the TCP global synchronization that results from each connection reduces the window to one and goes through Slow-Start in response to a dropped packet at the same time. In [6], the RED gateway calculates the average queue size, which is compared to a minimum and maximum threshold. When the average queue size is between the minimum and maximum thresholds, each arriving packet is dropped with probability  $p_a$ , where  $p_a$  is a function of the average queue length. Applying the RED idea here in the context of DNS-based load balancing, the probability of a web server becoming overloaded is directly proportional to its current load. A line chart example of the probability of a web server becoming overloaded is shown in Fig. 5.

FIG. 5: CHANGE OF STATE OF RED METHOD



In the above example, the minimum threshold is 70% and the maximum threshold is 90%. When the load of a service server is less than 70%, its state should be under-load. When the load of a service server is greater than 90%, its state would be overloaded. Finally, when the load of a service server is between 70% and 90%, the probability of its state becoming overloaded is proportional to its current load.

**6. CONCLUSION**

In this paper we examined various techniques for a DNS-based distributed web-server system and summarized their load balancing performance. This paper concludes that various studies on web based management system using load balancing techniques: i) in distributed web server systems like round robin method, ii) in DNS based load balancing single point of failure can be overcome by if the master DNS server fails, one of the slave DNS servers can take over the subsequent work for the master DNS server, therefore achieving high reliability, iii) in load buffer range method, a conventional method defines a load buffer range (LBR) with low and high thresholds for each web server, iv) in Random Early Detection method, when the load of a service server is between 70% and 90%, the probability of its state becoming overloaded is proportional to its current load.

**REFERENCES**

1. V. Cardellini, M. Colajanni, P.S. Yu, "Dynamics load balancing on web-server systems" IEEE Internet Computing, Vol.3, No.3, pp. 28-39, May-June 1999.
2. Chih-Chiang Yang, Chien Chen and Jing-Ying Chen, "Random Early Detection Web Servers for Dynamic Load Balancing", IEEE 2009.
3. M. Arora, S.K. Das, R. Biswas, "A De-centralized Scheduling and Load Balancing Algorithm for Heterogeneous Grid Environments," In Proceedings of Workshop on Scheduling and Resource Management for Cluster Computing, pp 499-505, Vancouver, Canada, Aug 2002.

4. W. Leinberger, G. Karypis, V. Kumar, R. Biswas. "Load balancing across near-homogenous multi-resource servers," In Proceedings of the Ninth Heterogeneous Computing Workshop, pp. 61-70, Cancun, Mexico, May 2000.
5. William Leinberger, George Karypis, Vipin Kumar, "Job Scheduling in the presence of Multiple Resource Requirements," In Proceedings of ACM/IEEE Conference on Supercomputing (SC '99) pp. 47-47 Portland, USA, Nov. 1999.
6. Baldev Singh, O.P. Gupta, Simar Preet Singh, "Performance Evaluation of DNS based Load Balancing Techniques for Web Servers", International Journal of Computer Science and Technology, Vol.2, Issue 1, March 2011.
7. M. Colajanni, P. S. Yu, V. Cardellini, "Dynamic Load Balancing in Geographically Distributed Heterogenous Web Servers," In Proceedings of Int'l Conf. Distributed Computing Systems, pp. 295-302, May 1998.
8. M. Aramudhan, and V. R. Uthariaraj, "LDMA: Load Balancing Using Decentralized Decision Making Mobile Agents", *Lecturer Notes on Computer Science*, Part IV, Vol. 3994, pp. 388-395, Springer-Verlag, 2006.
9. Zhong Xu, Rong Huang, Laxmi N. Bhuyan, "Load Balancing of DNS-Based Distributed Web Server Systems with Page Caching", IEEE.
10. M. Colajanni, P.S. Yu, D.M. Dias, "Scheduling algorithms for distributed Web servers," In Proceedings of 17<sup>th</sup> IEEE International Conference on Distributed Computing Systems (ICDCS '97), pp. 167-176, Baltimore, USA, May 1997.
11. A. Shaikh, R. Tewari, and M. Agarwal, "On the Effectiveness of DNS-based Server Selection," In Proceedings of IEEE INFOCOM 2001, pp. 1801-1910, Anchorage, USA, April 2001.

## DETERMINING EFFECTIVE FACTORS ON ADJUSTMENT SPEED OF CAPITAL STRUCTURE IN TEHRAN STOCK EXCHANGE LISTED COMPANIES

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### ABSTRACT

*Optimum capital structure is subject of many studies. Current theories about capital structure state that a company with optimum capital structure can increase company's value and shareholders' wealth and decrease capital cost. This study intends to determine effective elements on adjustment speed of capital structure. Descriptive and correlative method was employed in this research. Dependant variables of this study are inflation, internal gross production, bank interest rate, exchange rate and specific features of the company (Tubin's Q, non debt tax shield, growth, assets' yield, working capital, tangibility, size) that had been tested through statistical techniques and multi-variable regression in form of time series data (macro-economic variables) and panel data (specific features of the company). The results indicated that inflation factor and interest rate had meaningful and reverse relation while exchange rate factor had meaningful and positive relation with adjustment speed of capital structure. No meaningful relation was observed between internal gross production and adjustment speed of capital structure. This study also represented that there is a meaningful and reverse relation between specific features of the company (including Tubin's Q ration, non debt tax shield, assets' yield, working capital, and size) and adjustment speed of capital structure and also there is meaningful and direct relation between growth and adjustment speed of capital structure. There is no meaningful relation between the tangibility and adjustment speed of capital structure.*

### KEYWORDS

Adjustment Speed of Capital Structure, Macro-economic Factors, Specific Features of the Company.

### 1. INTRODUCTION

Optimum capital structure is subject of many studies. Current theories about capital structure state that a company with optimum capital structure can increase company's value and shareholders' wealth and decrease capital cost. Adjustment of capital structure shall carry out in consideration of adjustment costs whenever the companies are deviated from optimum capital structure. Theoretical subjects in field of capital structure are seeking such a balance between debt and equity, which are two main financial sources, to maximize company's share value and minimize financing costs. In other words, by increasing share value and decreasing capital costs, the company may acquire a level of efficiency that will subsequently result in shareholders' wealth (as main shareholders) increase, technically referred as optimum capital structure (equilibrium point) (Tehrani, 2012).

### 2. THEORETICAL LITERATURE

Capital structure refers to the manner of combination of company's financing resources including short-term debts, bonds, long-term debts, preferred stocks and common stocks. Some companies have no pre-planned program for their capital structure. Such companies are changing their capital structure only on the basis of financial decisions which are made by financial manager. Although these companies may be successful in short-term performance, they will face considerable problems in supplying required financial resources and may be unable to optimally employ their current resources. Therefore, it is completely clear that a company shall plan its capital structure in a manner to maximize its productivity and more easily adjust its condition in accordance with changing situations (Vakili Fard, 2011).

Nowadays, companies' managers are looking for the methods of financing and decision making in a manner to maximize share market value or in other words maximize the shareholders' wealth. Common shareholders want to receive maximum interest from their primary capital and the lenders expect the company to settle their debts in due dates. Accordingly, the probability of bankruptcy of a company is so important for these two groups. As profitability ratios of the firm is being measured in net profit analysis in comparison with sales income or investments, the actual purpose of the manager is achieving maximum profit for common shareholder. The researcher had selected title of this study considering this requirement and also by performing various library researches and checking different scientific websites and articles in order to study this subject in Iranian capital market.

#### 2.2. LITERATURE

Omar Camara (2012) had studies the impacts of macro-economic variables in multinational and domestic corporations on capital structure and adjustment speed during 20 years period from 1991 to 2009 by considering companies' information in Compustat. The results indicated that these variables have important impacts on adjustment speed of capital structure. These results represented that there is a considerable difference between multinational corporations and domestic corporations; multinational corporations are adjusting their capital structures with higher speed in comparison with domestic corporations.

Mangi & Simon Amania (2012) were studies whether Kenyan companies have Optimal Target leverage and are they moving toward. They tried to determine adjustment rate of capital structure in Kenyan companies to optimal target leverage. They investigate Kenyan companies between 1999 and 2010 (12 years period). The results revealed that only 23 companies (among 30 studies companies) had optimal target leverage and a company with 5.3% of deviation from purpose capital structure will need 10 years to achieve its purpose capital structure.

Noorani et al. (2012) investigated the relation between capital structure and capital return of eighteen Iranian banks from 2003 till 2009. The results of model estimate through regression models with panel data indicated that there is a positive relation between financial levels and capital return. Analysis for determining the relation between assets return and capital structure had also developed. The results confirm this hypothesis that there is a positive relation between assets return and capital structure. Positive relation between debt ratio and profitability criteria was another finding of this study. It is noteworthy that that profitability had been described in this study as two different criteria of assets return and capital return.

Setayesh & Jahromi (2011) had studied the effects of market competitions on Tehran Stock Exchange listed companies. So, the effects of Tubin's Q ratios and concentration (Herfindal-Hirschman concentration ration of 4) on companies' debt ration. Statistical samples of this study include 86 companies in 8 year period from 2002 till 2009. The results revealed that market competition and capital structure of various industries differs. Moreover, in case of employing Tubin's Q ratio and Herfindal-Hirschman ratio for measuring competition in product market, there is a meaningful and positive relation in product market and companies'

capital structure which confirm game theory. This research also approved non-linear level three relation between Tubin's Q ratio and capital structure. Moreover, after investigating dynamic relation between competition in product market and capital structure, it was revealed that there is purpose capital structure in studies industries with adjustment speed of 45%.

### 3. METHODOLOGY

#### 3.1. METHODOLOGY

The method of this research was descriptive correlative with ex-post facto nature. Data gathering is one of the most important parts of every research. The required data for theoretical subjects were collected through library search. For testing the hypotheses of this study, financial data were gathered from stock exchange information.

#### 3.2. STATISTICAL POPULATION AND SAMPLE VOLUME

Studied statistical population is Tehran Stock Exchange listed companies which had been in stock exchange list from 2002 till 2011, their fiscal year ended on March 20<sup>th</sup> of each year and are not among investment companies and banks. Considering these restrictions, final statistical population includes 56 corporations.

#### 3.3. DATA GATHERING METHODS AND TOOLS

Information about financial statements and documents of listed companies were gathered from websites of Stock Exchange Organization and Tadbir Pardaz data software while information about macro-economic variables were gathered from different publications of Central Bank including Quarterly National Accounts Special Edition Magazine, Economical Indicators, and also internet website of Central Bank.

#### 3.4. RESEARCH QUESTIONS

The main questions that this study aimed to answer them are as follows:

1. Is there any meaningful relation between inflation and adjustment speed of capital structure?
2. Is there any meaningful relation between gross domestic product and adjustment speed of capital structure?
3. Is there any meaningful relation between exchange rate and adjustment speed of capital structure?
4. Is there any relation between bank interest rate and adjustment speed of capital structure?
5. Is there any meaningful relation between specific features of the company and adjustment speed of capital structure?

#### 3.5. RESEARCH HYPOTHESES

The researcher had developed following hypotheses in accordance with aforesaid questions:

1. There is meaningful relation between inflation and adjustment speed of capital structure.
2. There is meaningful relation between gross domestic product and adjustment speed of capital structure.
3. There is meaningful relation between exchange rate fluctuations and adjustment speed of capital structure.
4. There is meaningful relation between bank interest rate and adjustment speed of capital structure.
5. There is meaningful relation between specific features of the company (Tubin's Q, non debt tax shield, growth, assets' yield, working capital, tangibility, size) and adjustment speed of capital structure.

#### 3.6. RESEARCH VARIABLES AND THEIR CALCULATION METHODS

##### 3.6.1. Dependant Variable

Dependent variable of this study is adjustment speed of capital structure which can be calculated through deducting financial level of current year  $BL_t$  from absolute value of ratio with delayed variable pause (financial level of previous year)  $BL_{t-1}$ . Hereunder is equation for calculating employed ratio in order to compute financial level (Omar Camara, 2012).

(3.1.)

$$\text{the ratio of debt to assets' book value} = \frac{\text{Book value of total debt}}{\text{book value of total assets}}$$

##### 3.6.2. Independent Variable

###### Inflation

According to economics, inflation refers to continued and irregular increase of general prices of goods and services which will result in purchase power and economical chaos. Inflation is increasing and irregular price increase (Azimi Arani, 2008).

###### Gross Domestic Product

Gross domestic product includes total Rials value of final goods and services that are produced by domestic economic units in specific period (annual or quarterly). (Central Bank Website)

###### Exchange Rate

A set of foreign currencies is called exchange. Iranian currency is Rials while all other currencies will be called as exchange (Wikipedia). In this study, inflation rate was calculated by referring to Central Bank website.

###### Interest Rate

Interest is the sum that borrower shall pay to lender for employing his/her financial resources in specific period (Faraji, 2003). In this study, interest rate was calculated by referring to Central Bank website.

###### Company's Specific Features

###### Tubin's Q

Tubin's Q ratio is calculated by dividing market value of all types of company's bonds, long-term debts, and book value of short-term debts on replacement value of company's assets. It is considerable that bonds include common shares, preferred shares and other types of published bonds (Hajiha & Maher, 2010). In this study, Tubin's Q ratio was calculated by dividing market value of company's assets on book value of them.

(3-2)

$$Q = \frac{COMVAL + SBOWD + STDEBT}{SRC}$$

COMVAL: closing market value of common shares (number of closing common shares multiplied by market value of each share at the end of year)

SBOWD: closing book value of long-term debts

STDEBT: closing book value of debts with less than one year maturity

SRC: closing book value of all company's assets

###### Non Debt Tax Shield (NDTS)

It is clear that payable tax of the company will increase by raise of its taxable income. Therefore, taxable income will decrease by increasing non debt tax shield. Accordingly, tax rate of the company and also expected return from interest tax shield will reduce (Omar Camara, 2012). In this study, tax shield was calculated through following equation (Omar Camara, 2012):

(3-3)

$$\text{Tax Shiled} = \frac{\text{Total Depreciation}}{\text{Total Assets}}$$

###### Tangibility

The company's tangibility may represent agency costs and unorganized financial status. In cases that company owns considerable tangible assets, it will be possible to use them as pledge and decrease the risks of lender debts agency costs. Therefore, company's financial level will increase by increasing its tangible assets (Hang & Sang, 2006).

Tangibility of assets was calculated through following equation (Omar Camara, 2012):

$$(3-4) \quad \text{Tangibility} = \frac{\text{Net Property, Plant \& Equipment (PPE)}}{\text{Total Assets}}$$

**Size**

Big companies are more varied and have more stable cash flows that this stability is reducing the probability of bankruptcy. Such companies have more bargaining power in employing debts and can decrease exchange costs of long-term debts distribution. On the other hand, big companies may have more varied shareholder which will result in reduced control on company's management. Accordingly, the managers may employ more debts in order to decrease personal loss risk resulted from bankruptcy (Chen & Rager, 2004).

In this study, company's size is calculated through following equation (Omar Camara, 2012):

$$(3-5) \quad \text{Size of the Company} = \text{Log (Total Assets)}$$

**Growth**

Growth is the other factor that may impact capital structure of the company. According to static balance theory, the companies with future growth occasions will borrow less than the ones with rare growth (the companies with large amount of tangible assets) because growth occasions are categorized as intangible assets that cannot be used as pledge (Chen, 2004).

The growth of companies is calculated through following equation (Omar Camara, 2012) (calculation method is described in attachment 10-3):

$$(3-6) \quad \text{Growth} = \frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$$

**Return on Asset (Total Assets/ Net Profit)**

This title is providing an idea about effective management in employing the assets to make profit (Profitable assets) which can be calculated through dividing annual profit on total assets of the company. Return on assets is represented in percentage and sometimes refers to return on investment (Yahyazadehfar & Nabavi, 2010). In this research, return on assets is calculated through following equation (Omar Camara, 2012):

$$(3-7) \quad \text{Return on Assets} = \frac{\text{Earnings before Interest and Taxes}}{\text{Total Assets}}$$

**Working Capital**

Working capital is an amount of current assets that had been supplied from long-term resources. Gross working capital is total current assets while net working capital is surplus of current assets on current debts. Working capital is an index for determining liquidity and solvency of a company especially in cases that it has been employed in comparison with other indices and financial ratios. Working capital is safety margin of creditor. Companies with borrowing difficulties in short term periods, shall have considerable working capital. Working capital is calculated through following equation (Kouhi & Ahmadi, 2010):

$$(3-8) \quad \text{Current Assets} - \text{Current Debts} = \text{Working Capital}$$

**4. DATA ANALYSIS**

**4.1. MODEL SPECIFICATION**

Partial Adjustment Model was employed in this method. As target leverage cannot be observe directly, Flannery and Rangan methodology (2006) was employed. Purpose capital structure ( $BL_t^*$ ), linear function of macro economical elements (Macro) and company's features (X) are as follows:

$$(4-1) \quad BL_t^* = \beta Macro_t + \varepsilon_t$$

$$(4-2) \quad BL_{it}^* = \beta X_{it} + \varepsilon_{it}$$

Replacement theory (Trade-off) is predicting that in full capital structure, companies are rapidly adjusting toward target leverage. Spot return to target leverage is equal to zero exchange cost (Hovakimian et al., 2001). Therefore, return to target leverage in defective capital market may happen in various intervals (partial adjustment). Accordingly, partial adjustment model is as follows:

$$(4-3) \quad BL_{it} - BL_{it-1} = \gamma (BL_{it}^* - BL_{it-1}) + \varepsilon_{it}$$

In (3-8) equation,  $\gamma$  coefficient is representing actual changes of capital structure from t-1 to t ( $BL_{it} - BL_{it-1}$ ) while  $\gamma$  is between zero and one and is indicating different adjustment periods.  $\gamma=1$  represents rapid adjustment or complete adjustment while indicating any deviation from target leverage. It means that target leverage is equal to actual leverage.  $\gamma$  may be equal to zero or near zero.

It is expected that  $\gamma$  be more than zero and less than one. By displacing equations 8-1 & 8-2 in 8-3, following equations will be resulted that was employed in current study:

$$(4-4) \quad BL_t = \gamma \alpha + (1 - \gamma)BL_{t-1} + \gamma \beta Macro_t + \varepsilon_t$$

$$(4-5) \quad BL_{it} = \gamma \alpha_{it} + (1 - \gamma)BL_{it-1} + \gamma \beta X_{it} + \gamma \varepsilon_{it}$$

The quantitative value of adjustment speed of capital structure can be calculated by deducting financial leverage of current year ( $BL_t$ ) from modulus of coefficient with delayed variable pause (financial leverage of previous year) ( $BL_{t-1}$ ). It is noteworthy that equation (4-7) was estimated through time series method from 2002 till 2011 in quarterly manner while equation (5-7) was estimated through panel data method for 56 companies from 2002 till 2011 in annual manner. Macro economical data were gathered from Iranian Central Bank website.

**4.2. DESCRIPTIVE STATISTICS OF RESEARCH VARIABLE**

The information about descriptive statistics of studies variables are represented in table 4-1.

**TABLE 4-1: DESCRIPTIVE STATISTICS OF EMPLOYED VARIABLES IN MODEL FROM 2002 TILL 2011** (Source: Researcher's findings)

Variable	Source	Average	Mean	Maximum	Minimum	Standard Deviation	Kurtosis	Skewness
CPIR (%)	Central Bank	3.8	3.8	8.6	-1.3	1.9	0.03	3.4
GDPR (%)	Central Bank	6.8	7.04	32.4	-23.4	16.7	-0.006	1.6
EXR (Rials)	Central Bank	9081.4	9226	10557.67	7994	798.195	2.8	13.9
R (%)	Central Bank	3.38	3.2	3.62	3.25	0.1437	0.17	1.59
BL	2240 data *	0.69	0.66	1.80	-0.43	0.88	5.5	-13.1
QT	560 data **	1.69	1.31	10.41	0.58	1.30	4.14	23.17
NDTS	560 data	0.02	0.02	0.50	0.00	0.03	11.91	214.84
TANG	560 data	0.25	0.21	0.88	0.00	0.18	1.08	3.83
SIZE	560 data	5.74	5.63	8.01	4.49	0.67	0.89	3.89
GROWTH	560 data	3.60	2.00	39.00	-6.00	4.64	4.30	24.57
ROA	560 data	13.81	11.63	53.74	-28.85	11.50	0.83	4.27
WC	560 data	-283941	17992	3629770	-26111525	2430392	-7.83	68.53
BL	560 data	0.64	0.65	1.22	0.10	0.16	-0.37	3.66

It is noteworthy that quarterly macro-data were employed in this study.

\* 4 periods in every year during 10 years for 56 companies

\*\* 10 years and 56 companies

**4.3. TESTING NORMAL DISTRIBUTION OF DEPENDANT VARIABLE**

Normality of data especially dependant variable is very important in performing statistical analysis. Therefore, it is necessary to be assured about normal distribution of dependant variable before testing research hypotheses and estimating the parameters and perform required procedures to normalize them (including conversion). In this study, Kolmogorov-Smirnov test was employed to test normality of data. Zero hypothesis and alternative hypothesis in this test are as follows:

H<sub>0</sub>: Normal distribution

H<sub>1</sub>: Not Normal Distribution

If statistic probability be less than 5% (sig<0.05), H<sub>0</sub> will be failed. As we employed a time series model, quarterly ratios of financial leverage were employed. Accordingly, Kolmogorov-Smirnov test shall be performed for quarterly debt ratio to test normal distribution. The results of this test are represented in table (2-4) which are indicating normal distribution of dependant variable.

**(4-2 ) One-Sample Kolmogorov-Smirnov Test**

N	Normal Parameters		Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
	Mean	Std. Deviation	Absolute	Positive	Negative		
b). 2240	.6564	.25109	.136	.133	-.136	.975	.298

**4.4. INVESTIGATING CONSISTENCY OF MACRO-ECONOMICAL VARIABLES (Panel Unit Root Test)**

In this section, consistency test was performed on all time series. In cases that time series are not consistent, it will be impossible to use unit root test because of appearance of spurious regression. Augmented Dickey-Fouler (ADF) Test (which is used in this section) is one of the most common tests for determining unit root in time series. If the F statistic be less than Mac Kinnon critical values, H<sub>0</sub> will be accepted. The results of employing variables in this pattern and subtracting their first order are represented in table (4-3). The results indicated that augmented Dickey-Fouler statistic is more than critical value which means that all of them are consistent.

**TABLE 4-3: CONSISTENCY OF MACRO-ECONOMICAL VARIABLES (Source: Researcher’s Findings)**

Variable	ADF Statistic	Mac Kinnon Critical Value in 5% Stage	Consistent Status
D(CPIR)	-7.67	-2.94	Consistent
D(GDPR)	-22.9	-2.94	Consistent
D(BL)	-7.81	-2.94	Consistent
D(R)	-6.33	-2.94	Consistent
D(EXR)	-5.61	-2.94	Consistent

D: indicates subtraction of variables first order.

**4.5. INVESTIGATING CONVERGENCY OF MACRO-ECONOMICAL VARIABLES**

The results of calculating cointegration vectors (according to maximum Eigen value test and impact test) are represented in tables (4-4) & (4-5); maximum Eigen value test and impact test are confirming the existence of four cointegration vectors that impact value statistic and maximum Eigen value are bigger that related critical values.

**TABLE 4-4: DETERMINING NUMBER OF COINTEGRATION VECTORS IN ACCORDANCE WITH IMPACT TEST (Source: Researcher’s Findings)**

Zero Hypothesis	Impact Statistic	Critical Value 95%	Probability
None *	***109.94	60.06	0.00
At most 1 *	***62.27	40.17	0.00
At most 2 *	***33.28	24.28	0.00
At most 3	**13.61	12.32	0.03
At most 4	0.56	4.13	0.52

\*\*\* Meaningfulness with 99% probability

\*\* Meaningfulness with 95% probability

Result: existence of four cointegration vectors

**TABLE 4-5: DETERMINING NUMBER OF COINTEGRATION VECTORS IN ACCORDANCE WITH MAXIMUM EIGEN VALUE TEST (Source: Researcher’s Findings)**

Zero Hypothesis	Impact Statistic	Critical Value 95%	Probability
None *	***47.67	30.44	0.00
At most 1 *	***28.99	24.16	0.01
At most 2 *	**19.67	17.80	0.03
At most 3	**13.05	11.22	0.02
At most 4	0.56	4.13	0.52

\*\*\* Meaningfulness with 99% probability

\*\* Meaningfulness with 95% probability

Result: existence of four cointegration vectors

**4.6. ESTIMATING THE MODEL – ANALYZING THE RELATION BETWEEN ADJUSTMENT SPEED OF CAPITAL STRUCTURE AND MACRO-ECONOMICAL FACTORS**

Table (4-6) is indicating the results of estimating adjustment speed of capital structure considering macro-economical factors on the basis of equation (4-8) which had been performed through Generalized Method of Moments (GMM) method.

In studies model, J-stat statistic is 4.24 and instrument rank and number of estimated coefficients are respectively equal to 14 & 6. Accordingly, it is possible to identify Sargan test. This test was distributed by  $\chi(p - \kappa)$  that  $\kappa$  is number of estimated coefficients and  $p$  is number of instrument rank.

Therefore, P-value of Sargan statistic  $\chi(4.24,14) = 0.89$  was calculated by employing Eviews software that zero hypothesis shall be confirmed with 95% of probability. In other words, employed tools have required validity.

In table (4-6); financial leverage coefficient of one period before (BL(-1)) is equal to 0.46 that according to previous descriptions if we deduct this figure from one, adjustment speed of capital structure will be resulted in consideration with macroeconomics shocks. Therefore,  $\gamma = 0.54$  represents relatively high adjustment speed of capital increase. The relation between adjustment speed of capital structure and macro-economical variables is represented in this model. The model is estimated through following equation:

$$BL_t = \alpha_0 + \alpha_1 BL_{t-1} + \alpha_2 BL_{t-1} * CPIR_t + \alpha_3 BL_{t-1} * GDPR_t + \alpha_4 BL_{t-1} * EXR_t + \alpha_5 BL_{t-1} * R_t + \varepsilon_t$$

$BL_{t-1} * CPIR_t$ : is product of multiplying adjustment speed of capital structure by inflation rate which is indicating bilateral relation between these two variables.

$BL_{t-1} * GDPR_t$ : represents reciprocal relation between gross domestic product growth rate and adjustment speed.  $BL_{t-1} * EXR_t$ : is indicating the reciprocal relation between adjustment speed of capital structure and exchange rate while  $BL_{t-1} * R_t$  represents same relation between bank deposits interest rate and adjustment speed. Hypotheses numbers 1 to 4 of this study are investigating the relation between macro variables and adjustment speed.

It is noteworthy that the results of Sargan statistic in estimated model revealed that selected tools are valid in a way that no meaningful correlation was found between the tools and results.

TABLE 4-6: THE RESULTS OF ADJUSTMENT SPEED OF CAPITAL STRUCTURE WITH MACRO VARIABLES – EQUATION NO. 4-7 (Source: researcher's findings)

Variable	Model		Confirm/Reject	Type of Relation	
	Coefficient	Statistic t			
Y-Intercept	0.60	***32.2			
Financial leverage of previous period	BL(-1)	0.46	**2.46		
Inflation rate	BL(-1)*CPIR	-0.01	**2.13	Confirm	Negative
Gross domestic product	BL(-1)*GDP	0.0002	0.33	Reject	-
Exchange rate	BL(-1)*EXR	9.12 E-6	**2.49	Confirm	Positive
Bank interest rate	BL(-1)*R	-0.11	**2.37	Confirm	Negative
R-squared	0.27				
D-W	2.04				
Instrument rank	14				
J-stat	4.24				
Sargan Test (P-Value)	0.89				

\*\*\* Meaningfulness with 99% reliability, \*\* meaningfulness with 95% reliability, \* meaningfulness with 90% reliability in estimation period which is from 2002 till 2011.

Model – Generalized Method of Moments (GMM)

H<sub>0</sub> of Sargan test state that employed tools have no relation with the results. Source: researcher's findings

Estimated form of the model by employing Eviews software shall be as follows:

$$BL_t - 0.46BL_{t-1} = 0.60 - 0.01CPIR_t * BL_{t-1} + 0.0002GDP_t * BL_{t-1} + 9.12E-6 * EXR_t * BL_{t-1} - 0.11R_t * BL_{t-1} \quad (2.46) \quad (32.2) \quad (-2.13) \quad (0.33) \quad (2.49) \quad (-2.37)$$

4.7. INVESTIGATING THE STABILITY OF COMPANY'S SPECIFIC FEATURES (Panel Unit Root Test)

In this study, stability test was performed on all time series before estimating data panel. Most of economical time series were instable with mostly falsified regressions. This test was performed on all variables of estimated models. The results of this test are represented in table (4-7). The figures in parentheses reveal the probability of Levin statistic which is smaller than 0.05 and rejects zero hypothesis of existence of unit root among the variables. All variables were in a stable status; therefore there were no need for fulfilling cointegration tests and the model has no falsified regression.

TABLE 4-7: RESULTS OF UNIT ROOT TEST OF VARIABLES (in company's features level)

Variable	Unit Root Test	Level	Status
BL	Levin et al	-9.7(0.0)	Stable
T-Q	Levin et al	-38.8(0.0)	Stable
TANG	Levin et al	-5.4(0.0)	Stable
SIZE	Levin et al	-13.4(0.0)	Stable
Growth	Levin et al	-35.4(0.0)	Stable
Wc	Levin et al	-7.7(0.0)	Stable
ROA	Levin et al	-12.4(0.0)	Stable
NDTS	Levin et al	-5.92(0.0)	Stable

The figures in parentheses are the smallest figures for first level error which will result in rejection of H<sub>0</sub> (P-value).

Source: researcher's findings.

4.8. ESTIMATING THE MODEL – INVESTIGATING THE RELATION BETWEEN ADJUSTMENT SPEED AND COMPANY'S FEATURES

Table 7 estimates adjustment speed of capital structure through equation (5-8) by employing GMM panel method. This table is investigating the relation between adjustment speed of capital structure and company's features that are represented in second and third columns.

❖ The results of table (4-8) indicate that financial leverage coefficient of one period before BL(-1) is equal to 0.21 which is meaningful. By deducting absolute value of coefficient of delayed dependant variable BL<sub>it-1</sub> from one (1-γ), adjustment speed of capital structure coefficient by considering company's features will be equal to 0.79 (γ=0.79) which indicates high adjustment speed of capital structure. This model was estimated as follows:

$$BL_{it} = \alpha_0 + \alpha_2 BL_{it-1} + \alpha_3 BL_{it-1} * QT_{it} + \alpha_4 BL_{it-1} * NDTS_{it} + \alpha_5 BL_{it-1} * Growth_{it} + \alpha_6 BL_{it-1} * ROA_{it} + \alpha_7 BL_{it-1} * TANG_{it} + \alpha_8 BL_{it-1} * SIZE_{it} + \alpha_9 BL_{it-1} * WC_{it} + \epsilon_{it}$$

BL<sub>it-1</sub> \* X<sub>it</sub>: is the result of multiplying adjustment speed of capital structure by company's features which indicates reciprocal relation between them. Hypothesis no. 5 refers to the relation between company's features and adjustment speed. Therefore, after calculating adjustment speed of capital structure in this model, its relation with other variables was investigated. It is noteworthy that adjustment speed of capital structure in model with company's features is higher than that was estimated in model with macro factors. It reveals that although considerable changes were occurred in macro-economical variables such as inflation, economical growth (GDP growth), interest rate and exchange rate, financial leverage is inclined to expected leverage (ideal financial leverage) with slower speed and macro-economical fluctuations will have more stable impacts on adjustment speed of capital structure and companies status. However, changes in specific features of the company will result in higher speed of declination of financial leverage to target leverage. It is noteworthy that the results of Sargan statistic in estimated model represent the validity of selected tools in a manner that no meaningful correlation was observed between tools and results.

TABLE 4-8: ESTIMATING THE IMPACTS OF COMPANY'S FEATURES ON ADJUSTMENT SPEED OF CAPITAL STRUCTURE (Source: researcher's findings)

Variable	Model		Confirm/Reject	Type of Relation	
	Coefficient	Statistic t			
Y-Intercept	0.38	***14.30			
Financial leverage of previous period	BL(-1)	0.21	***4.77		
Tubin	BL(-1)*QT	-0.05	**2.33	Confirm	Negative
Tax Shield	BL(-1)*NDTS	-0.75	***2.95	Confirm	Negative
Growth	BL(-1)*GROWTH	0.03	***4.72	Confirm	Positive
Assets Return	BL(-1)*ROA	-0.01	***11.28	Confirm	Negative
Working Capital	BL(-1)*WC	-9	***2.68	Confirm	Negative
Tangibility	BL(-1)*TANG	0.005	0.06	Reject	-
Size	BL(-1)*SIZE	-0.05	*1.92	Confirm	Negative
R-squared	0.79				
D-W	1.78				
Instrument rank	71				
J-stat	44.03				
Sargan Test (P-Value)	0.96				

\*\*\* Meaningfulness with 99% reliability, \*\* meaningfulness with 95% reliability, \* meaningfulness with 90% reliability in estimation period which is from 2002 till 2011.

Model – Generalized Method of Moments (GMM)

$H_0$  of Sargan test state that there is no relation between employed tools and the results.

**Estimated form of the model by employing Eviews software shall be as follows:**

$$BL_t - 0.21BL_{t-1} = 0.38 - 0.05QT_t^*BL_{t-1} - 0.75NDTS_t^*BL_{t-1} + 0.03GROWTH_t^*BL_{t-1} - 0.01ROA_t^*BL_{t-1} - 6.8E - 9CC_t^*BL_{t-1} + 0.005TANG_t^*BL_{t-1} - 0.05SIZE_t^*BL_{t-1}$$

#### 4.9. RESULTS OF TESTING THE HYPOTHESES

The first hypothesis of this study was tested to reveal whether there is meaningful relation between inflation and adjustment speed of capital structure. In accordance with results,  $BL_{t-1}^*CPIR_t$  coefficient is equal to -0.01 and t statistic is equal to -2.13 which indicate meaningful relation between adjustment speed of capital structure  $BL_{t-1}$  and inflation rate  $CPIR_t$  with 95% of probability. Accordingly, inflation increase will result in adjustment speed decrease which in agreement with expectations and confirm first hypothesis stating the existence of meaningful relation between inflation and adjustment speed of capital structure. These results were in conformity with the results of Omar Camara (2012), Kook & Teng (2010), and Hakbars (2006) researches.

Second hypothesis was tested to investigate probable meaningful relation between gross domestic product and adjustment speed of capital structure. According to results,  $BL_{t-1}^*GDP_t$  coefficient was equal to 0.0002 and the statistic was 0.33 which has limited degree of meaningfulness. Therefore, second hypothesis did not confirm. The results were in contradiction with the results of Kook & Teng (2010) while no other similar cases were found.

Third hypothesis was tested to indicate whether there is meaningful relation between exchange rate and adjustment speed of capital structure. As the results revealed,  $BL_{t-1}^*EXR_t$  coefficient was positive and t statistic was equal to 2.49 which is meaningful. So, third hypothesis which questioned the meaningful direct relation between exchange rate and adjustment speed of capital structure was confirmed. These results are concordant with the results of Kook & Teng (2010) and Hakbars (2006) researches.

Hypothesis number four questioned the meaningful relation between bank interest rate and adjustment speed of capital structure. The results of testing this hypothesis showed that  $BL_{t-1}^*R_t$  coefficient is negative and t statistic is equal to 2.37 which are meaningful with 95% of probability and interest rate increase will result in adjustment speed decrease. Thus, there is meaningful and reverse relation between bank deposit interest rate and adjustment speed of capital structure. The results are similar as Omar Camara (2012), Kook & Teng (2010), and Hakbars (2006) studies.

The fifth and last hypothesis was tested to investigate the existence of meaningful relation between company's specific features (Tubin's Q, non debt tax shield, growth, assets' yield, working capital, tangibility, size) and adjustment speed of capital structure. The results of unit root test revealed that ADF statistic of both company's features and adjustment speed of capital structure were smaller than 5% which rejects zero hypothesis based on existence of unit root between variables. In it noteworthy that all variables were in stable status and there were no need for performing cointegration tests and the model had no falsified regression.

## 5. DISCUSSION

Assessing the variables and testing the hypotheses of this study revealed that the changes and fluctuations of macro-economical variables are impacting adjustment speed of capital structure and generally impact operations of the companies. Also, desirable or undesirable economical status may considerably impact the companies (their commercial activities). Accordingly, any changes in these factors shall be controlled and supervised by governments in order to improve national commercial and economical activities.

On the other hand, assets return is one of the most important parameters that are impacting adjustment speed of capital structure or financing decisions. The companies are recommended to be more careful in valuation of their assets.

## 6. RESEARCH RECOMMENDATIONS

### 6.1. THE RECOMMENDATIONS IN RELATION WITH RESEARCH HYPOTHESES

- As per the results of the research, about the four first hypotheses, the financial managers are recommended to notify the positive impact of exchange rate and bank deposits and also negative impacts of interest rate and inflation relation on capital structure in making decision about financial status and combining financial resources of required cash amounts; and also investigate the changes of these variables.
- According to the results of testing fifth hypotheses, companies and financing institute managers are recommended to consider this issue by performing more up to date and comprehensive assessments. The companies shall also be more careful in valuation of their assets.

### 6.2. SUGGESTIONS FOR FUTURE RESEARCHES

- The researchers of political issues are recommended to investigate economical boycotts in their future studies and also inspect other factors which are affecting adjustment speed of capital structure of Tehran Stock Exchange listed companies including commercial risk, and research and development costs.
- It is also recommended to investigate the effects of other macro-economical factors such as real variables (oil price, deposit, tax rate) and monetary variables (liquidity volume, consumer's price index) in future studies.
- The upcoming researches shall study longer time period (20 years) to achieve more precise results about calculating adjustment speed of capital structure.
- This study can be fulfilled while focusing on various industries and their specific features.
- Considering the importance of debts in determining optimum structure of capital and increasing shareholders' wealth, the authorities of capital market are recommended to provide an organized market for distributing debt bonds of public joint stock companies.

## 7. REFERENCES

- Azimi Araei, Hossein (2006), "Undeveloped Circuits in Iran Economy", Ney Pub., 7<sup>th</sup> Edition.
- Central Bank Website ([www.cbi.ir](http://www.cbi.ir))
- Chen J. and S. Roger, (2005) the Determinants of Capital Structure: Evidence from Chinese Listed Companies, Economic Change and Restructuring, Vol. 45, No. 5.
- Hajiha, Zohre & Ghasab Maher, Leila (2010), "Investigating the Relation between Capital Structure and Intangible Value of Commercial Unit through Tubin's Q Ration in Iran Capital Market", Financial Engineering & Portfolio Management Magazine, No. 4, Fall 2010.
- Huang, G & F. M, Song (2006). The Determinants of Capital Structure: Evidence from China. China Economic Review, 17, pp: 14- 36
- Nourani, Seyed Mohammad Reza; Amiri, Hossein; and Mohammadian, Adel (2012), "Casual Relation between Bank Capital and Profitability by Emphasizing supervisory Aspect of Capital Structure", Growth & Economic Development Quarterly Magazine, No. 6.
- Omar Camara (2012), "Capital Structure Adjustment Speed and Macroeconomic Conditions: U.S MNCs and DCs", Master Thesis, School of Management, University of St. Andrews, UK.
- Setayesh, Mohammad Hossein & Jahromi, Mohadeseh (2011), "Investigating the Effect of Competition in Product Market on Capital Structure", Financial Accounting Experimental Studies Quarterly Magazine, First Year.
- Song Shin H. and T. Adrian (2009), Federal Reserve Bank of New York Staff Reports, Working Paper, <http://papers.ssrn.com>.
- Tehrani, Reza (2012), "Financial Management", Negah Danesh Pub., 10<sup>th</sup> Edition.
- Vakilifard, Hamidreza (2011), "Decision Making about Financial Issues", 3<sup>rd</sup> Volume, Jangal Pub.
- Yahyazadehfar & Nabavi (2010), "The Effect of Company's Features on Capital Structure of Tehran Stock Exchange Listed Companies", Jahad Daneshgahi Magazine

## INVENTORY OF KNOWLEDGE MANAGEMENT AND EFFECTIVE UTILISATION OF ORGANISATIONAL RESOURCES

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### ABSTRACT

*In the organization, an asset that is enriched inside it is the knowledge. But unfortunately, knowledge is not being well managed and it's like a waste because there is no right channel to share, to find and to be utilized. Knowledge should be categorized into specified domain where it can arrange and be classified systematically. Moreover, knowledge is more important to be shared but at the same time, the privacy and confidentiality should be protected. To overcome the problem of unmanageable knowledge, knowledge inventory system has developed and it contain a repository of knowledge, the taxonomy and also the permission to shared it as a public or as confidential. Two important characteristic that have been identify to attract the user to use this system of knowledge. The two characteristic are usability and ease of use. It is important to deliver a good quality of knowledge inventory and boost its sharing among organization.*

### KEYWORDS

Knowledge Management, Knowledge map, Knowledge inventory.

### INTRODUCTION

With the rapid and constant changes taking place in information technology and the Internet, traditional business models must continue to meet the changing business environment in order to survive. Only firms participating in the creation and utilization of knowledge can hope to enjoy the rewards of business reform in today's knowledge-based economy. Thus, the issues surrounding knowledge management have attracted more and more concern from both industry and academia. Due to the technological features of the profession, the processing industry has a close relationship with the adoption, creation and warehousing of knowledge, research and marketing being one of its core competencies. Effective knowledge management can help the processing industry to accumulate core knowledge, build corporate intelligence and gain a competitive edge.

A large amount of literature has stressed out the important of having knowledge management and the adaptation in the organization. Some other literatures has separately discussed about their architecture, their concept to having knowledge management, knowledge mapping, knowledge collaboration and issues related with knowledge management. In this respect, knowledge design and inventory mapping are in timely manner is a critical job as it directly affects the success or failure of a knowledge management.

In particular, the idea of having knowledge inventory Unit is to enable the sharing information and knowledge within organization and other agencies. However, in order to enable the knowledge management between organizations, the main part that should be looked upon is taxonomy. This paper shows that taxonomy play an important roles to determine where is knowledge belongs to. This will make knowledge management to be more useful and reliable and directly represent an agreed vocabulary of topics arranged around a particular theme. The focus on this paper is to come out with the prototype of knowledge inventory that content repository of knowledge and directly able to give knowledge deposited into.

### SIGNIFICANT OF THE STUDY

This paper is significance to the domain of knowledge management as it extends the knowledge base that currently exists in that field. The concept of knowledge inventory is relatively new to the majority of knowledge organizations. The knowledge as a valuable asset will offer more beneficial to organization if it was utilized by organization. Therefore, this paper explores the knowledge taxonomy, the repository and knowledge architecture which will help to raise awareness among those who are unacquainted with its potential applications and benefits within their organization setting. To illustrate the potential of a knowledge inventory, the paper investigated the existing model of knowledge inventory, and relative work that has been conducted by other researchers. The findings which have resulted from previous and current studies are to be implemented into the prototype application.

### PROBLEM STATEMENT

Knowledge inventory is an activity that combined a set of strategies and practices in order to capture, create, store and spread knowledge and experience within the organization. Government organizations worldwide are facing challenges as administrative, executive and judicial bodies continue to evolve into an electronic work environment pushed by paperwork, reduction mandates, and requirements to handle increase workloads. So they need to optimize their knowledge to keep competitive and give public better quality of services.

With the much information that provided by organization, people can't effort to remember everything and quite difficult to find it when it's needed. Organizing of information has no specification categories and keyword. People tend to create it and categorized it by their own perception. Information technology was found to be main source of knowledge initiative in administrative sector, followed by research and development. Collaboration between organization where can extend competition with private sectors is a crucial factor.

### THE PROBLEM

1. The main problem that haunted many organizations is the knowledge is not being managed as well. They need to recognized the knowledge that available in the organization either it was in tacit knowledge or explicit knowledge. The knowledge that are not being used optimizing will slowly fade out from organization as its not being recorded, captured into specified way.
2. Creating taxonomy also is a challenge to organization to provide quality knowledge inventory. Taxonomies are the basis of classification schemes and indexing systems in information management such as the Dewey Decimal System. Taxonomies are even more wide spread with applications including post codes (zip codes) used by postal services, and job categories used by tax collection agencies. With the advent of the internet, there has been increased interest in using taxonomies for structuring information for easier management and retrieval.

3. The security of the knowledge is also the crucial thing that leads to the problem. Knowledge is labeled as confidential and only authorized person can handle it. Some of the knowledge contents the private knowledge that should be avoided data leakage. The exposure knowledge to unauthorized person will lead to data leakage and it will be worse if the knowledge is being misused.

**RESEARCH METHODOLOGY**

**RESEARCH OBJECTIVE**

Generally, the objective of this paper is to have a better knowledge management component where it enable the information sharing among the staff. It is believed that it is important to effectively and efficiency manage these organizational element in order to have successful knowledge management. This, paper is an attempt to verify the key of elements on knowledge management process. Specifically, these objectives are:

- To develop the repository that content specified attribute to support the knowledge sharing by enabling depositing and sharing.
- Aim to leverage “know-how “across entire organization, for improving decision making, and increase innovation

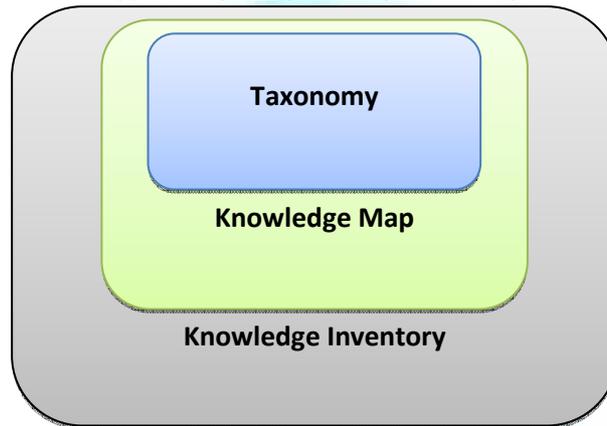
**RESEARCH SCOPE**

In this paper, knowledge inventory system is designed to enable knowledge sharing and depositing. So the scopes of this paper are listed below:

- To develop repository that can store all the knowledge provided by staff.
- To create the taxonomy to identify the knowledge with the specified category
- To develop the prototype of knowledge inventory

**PROPOSED FRAMEWORK**

**FIGURE 1: KNOWLEDGE INVENTORY FRAMEWORK**



This section of the paper describes about the proposed framework that will use to develop knowledge inventory as it’s shown in figure 1. One of the most important elements for effective knowledge management is to get a picture of the knowledge in the organization. This amounts to finding answers to the question what uses the knowledge, which knowledge is used, where the knowledge is used, when the knowledge is used, and which organizational role provides the knowledge. While creating k-inventory, the main activity should be considered is database. On this phase, database are creating and focusing to the comprised actors. Based on the proper field and relationship among the table, database are determined into knowledge, ownership, document, type of role, and users. Explicit and tacit knowledge are accepted and recorded into the database.

Knowledge inventory will lead to creating knowledge map where information can be mapped for a routine process such as searching and expertized mapped. Knowledge mapping is a process of surveying, assessing and linking the information, knowledge, competencies and proficiencies held by individuals and groups within an organization. Finally, the heart of knowledge inventory is having taxonomy for the knowledge created by the user. It is constructing a roadmap to locate the information needed to make the best use of resources, independent of source or form.

**DESIGN PHASE**

The design phase is described on how the system will be built. This system includes the physical construction, hardware, software, operating system, programming, and communication. Next step is to develop the knowledge inventory, based on data analysis. The physical characteristics are specified and detailed design is prepared.

**User interface**

User interface design is the design of computers, software application, and websites with the focus on the user’s experience and interaction. It’ also created an effective communication medium between a human and a computer (Pressman, 2001)

The proposed system is a web-based system where users interact with the system for depositing the knowledge, sharing knowledge and search the knowledge. In doing so the following criteria has been followed as a guide in creating user interface design for knowledge inventory system:

- Web page should be understandable and self-explanatory
- Minimal user input
- Strive for simplicity – “keep it simple”
- Organize, economize and communicate

**Quality attribute of knowledge management**

The important attributes involve in this system is ease of use and usability attributes. This two attributes that are proposed can influence the acceptance of knowledge inventory. In order to deliver a good quality of knowledge inventory, certain attributes are needed to highlight to ensure the best qualities are delivering.

Davis (1989) proposed a Technology Acceptance Model (TAM) that demonstrates similarities to the diffusion of innovations theory, and he proposed two factors that influence the acceptance of technology, which are: Usefulness and Ease of use. Each of the characteristic has its own definition. Table 1 explains in details the definition for each characteristic.

**TABLE 1: KNOWLEDGE INVENTORY CHARACTERISTICS WITH DEFINITION**

Knowledge inventory characteristic	Definition
1. Usability	Information on products and services online, other information that customer needs (Jun & Cai, 2001).
2. Ease of Use	User friendly, easy login, accessibility of the Web site, functions that customers need, easy navigation (Jun & Cai, 2001).

**RESULT AND DISCUSSION**

This paper develops the repository for knowledge inventory in Unit the result for this study. The data that were collected from questionnaire for evaluation is analyzed and concluded.

Discussion section exposes research findings which then we further analyzed to meet the objectives of research and answer the research questions. Microsoft Excel software is used to calculate the data gathered from the respondent. The questions asked in the questionnaire are relevant in term of evaluating the ease of use and also usability.

**ANALYSIS**

There are 30 questionnaires distributed to respondent in two different sections (department) which is at Unit 20 of them are come from Information technology department (ICT) and the rest is from Macroeconomic department. They are being asked to answer the questionnaire after experience the knowledge inventory system. 19 respondents were male and the rest (11) is female. All of them together are coming from different position and field.

The questionnaire contains 12 question and main focus into two perspectives. The first perspective is looking forward to the usability. There are 5 question related to usability. Another perspective is ease of use. In this domain, also 7 questions are given to the user that needs to fill out.

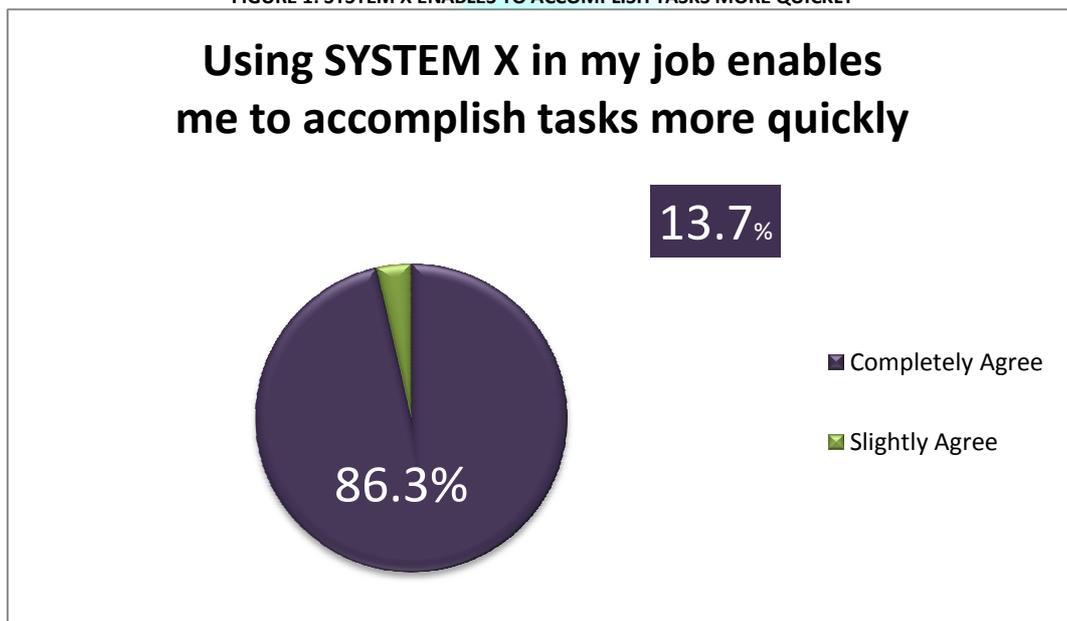
**Usability**

The usability of a system, as defined by the ISO standard ISO 9241 Part 11, can be measured only by taking into account the context of use of the system. Furthermore, measurements of usability have several different aspects:

- effectiveness (can users successfully achieve their objectives)
- efficiency (how much effort and resource is expended in achieving those objectives)
- satisfaction (was the experience satisfactory)

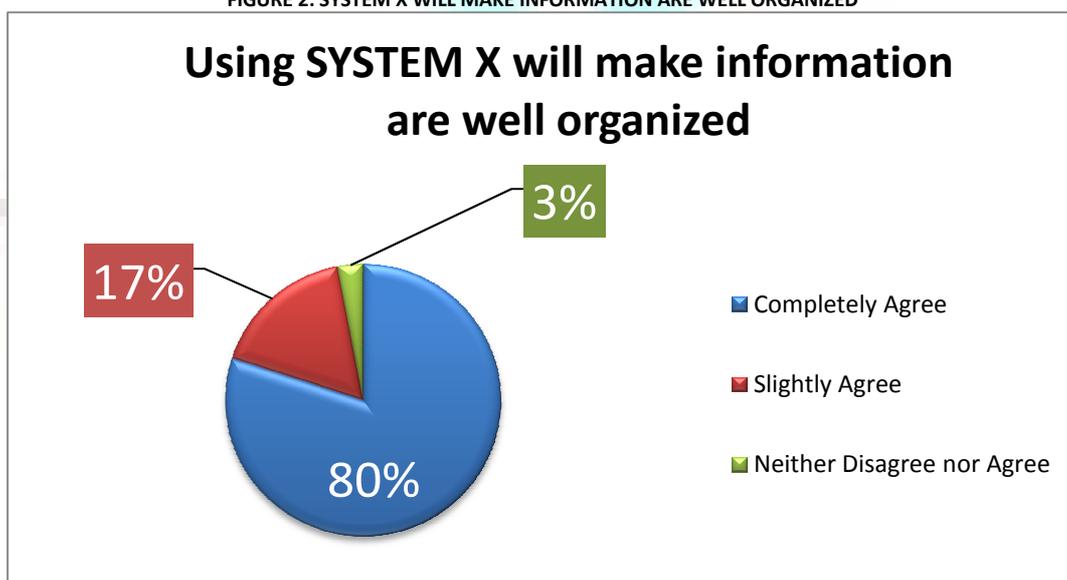
From the analysis of the question given that related to the usability, 86.3% respondent are completely agreed by using knowledge inventory system in their job/task, will enable them to accomplish the job quickly. 13.7% respondent slightly agrees with using the system, their job can be accomplished in shorter time compared to the manual method. Based on figure 18, we can measure that the knowledge inventory are capable giving them more resources and directly lead them to accomplish the task given in the organization with a few of click using the system.

FIGURE 1: SYSTEM X ENABLES TO ACCOMPLISH TASKS MORE QUICKLY



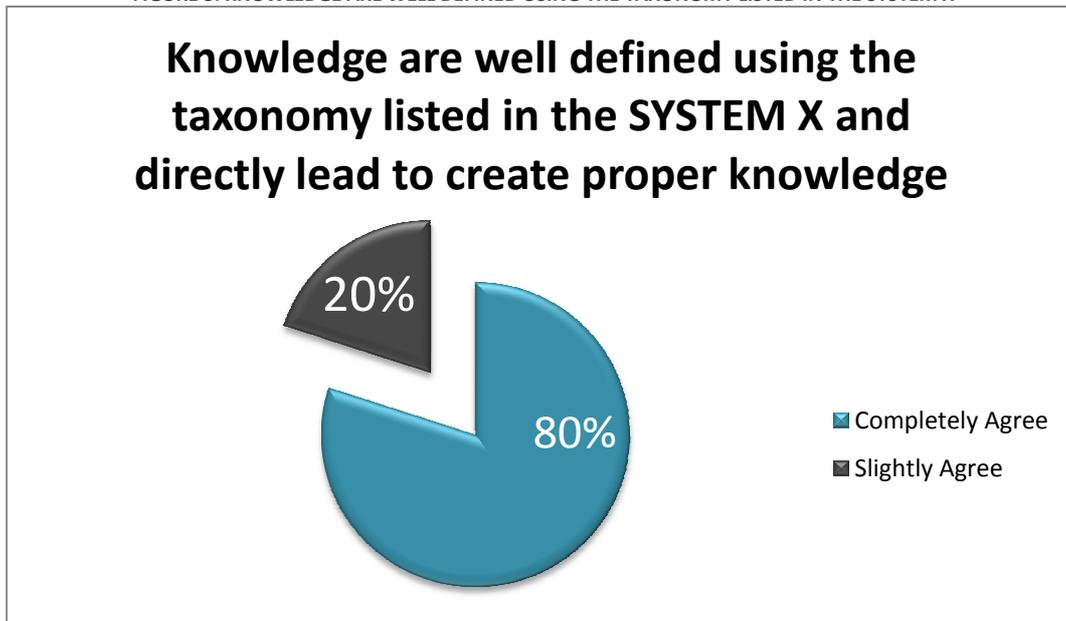
The main objective of this paper is to manage the knowledge that is enriched in the organization. Fromm the survey, we populated that 80% of respondent are completely agreed with using knowledge inventory system that are created, it will able to make information well organized. 17% respondents are slightly agreed and 3% are choose neither disagree nor agree. By this analysis, we can say that the system can organized the knowledge in the organization. See the figure of 2.

FIGURE 2: SYSTEM X WILL MAKE INFORMATION ARE WELL ORGANIZED



From the questionnaire, the analyze of taxonomy are also is part of usability. These analyses are made from using the question of "Knowledge are well defined using the taxonomy listed in the SYSTEM X and directly lead to create proper knowledge". The result shown that 80% completely agreed with the taxonomy used in the system,, and 20% are slightly agreed with it. The figure of 20 had shown the satisfaction of well-defined of taxonomy in the system.

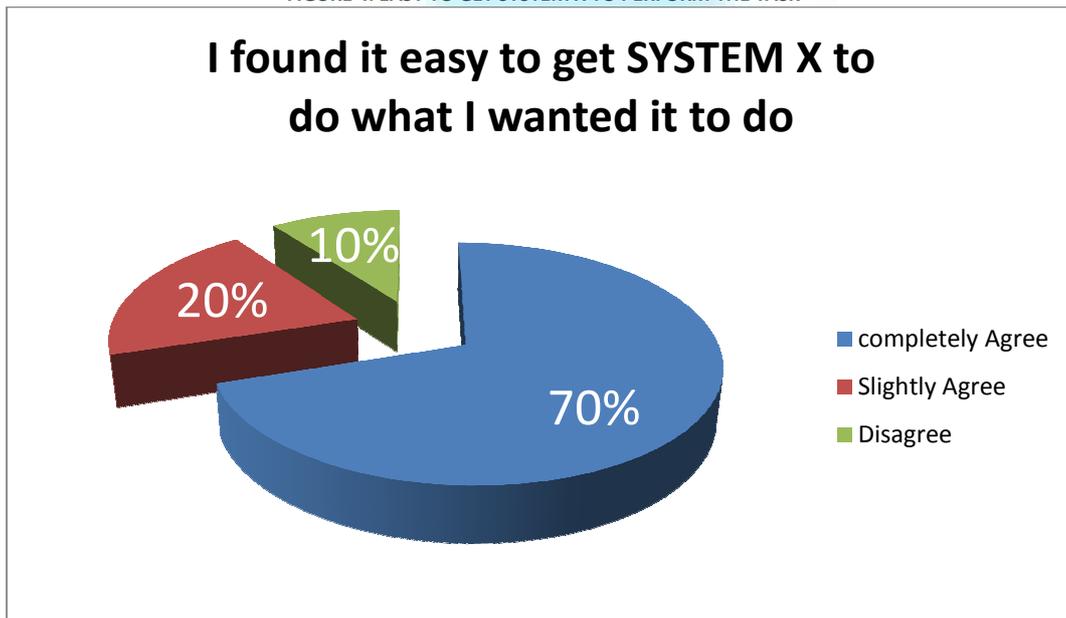
FIGURE 3: KNOWLEDGE ARE WELL DEFINED USING THE TAXONOMY LISTED IN THE SYSTEM X



**Ease of use**

In analyzing the ease of use of the system, a few questionnaires are chosen to prove the concept of ease of use. The question such as “I found it easy to get system X to do what I want to do” is lead us to prove the system have a user friendly interface and make it simple for user to do process provided such as knowledge creating, knowledge sharing and also searching. Figure 3 showed the rating from the user about the ease of use and figure 4 showed the interface of knowledge creating.

FIGURE 4: EASY TO GET SYSTEM X TO PERFORM THE TASK



Interface should be easy to understand as its part of ease of use characteristic. In order to have a good knowledge inventory, we included a few shot screen to show the ease of use that including in the system. Figure 3 are showed the interface of list of knowledge are shared to the user and figure 4 showed knowledge approval

**DISCUSSION**

After analyzing the problem of knowledge inventory, a few issue are discovered that lead to become a challenge for knowledge inventory. Searching is a most important thing that need to be look at. User concern on how can they get the knowledge with faster, accurate and also from some suggestion like what search engine offer for them. So, to solve the problem, the proposed knowledge inventory provide searching method that can enable user to type whatever word that they are looking for if they don't know the title of the knowledge, the depositor and other common attribute. The searching method used in this proposed system is manipulated with matching knowledge description, knowledge title, knowledge rating and also comment from user. Figure 4 shows the searching methods that are included in proposed knowledge inventory system.

**CONCLUSIONS**

The aim of this paper is to develop the repository for the knowledge inventory, creating the taxonomy that will be categorized knowledge into specified domain and also develop proposed knowledge inventory. The aim has been satisfied, user are able to create the knowledge using an interface and stored into dedicated repository, leveraging the knowledge into public or confidential security. Finally, this paper might suggest a direction for further studies and research on knowledge inventory in public service, and which might include applicants' perceptions and views on knowledge management.

**REFERENCES**

1. Andrew N. K. Chen, Yuhchang Hwang , T. S. Raghu (2005) Knowledge Life Cycle, Knowledge Inventory, and Knowledge Acquisition Strategies. 3-12

2. Jeffrey Cummings (2003). Knowledge Sharing: A Review of the Literature. The World Bank Operations Evaluation Department. Pages 22-40
3. Jing Wang, Kholekile Gwebu, Murali Shanker, Marvin D. Troutt (2008) An application of agent-based simulation to knowledge sharing, Decision Sciences Department, Whittemore School of Business and Economics, University of New Hampshire, United States
4. Lall, S. (2000). "Technological change and industrialization in the Asian newly industrializing economies: Achievements and challenges," Chapter 2 in L. Kim and R.R. Nelson, editors, Technology, learning, and innovation: Experiences of newly industrializing economies, Cambridge, UK: Cambridge University Press
5. Paul Almeida, Bruce Kogut (1999) Localization of Knowledge and The Mobility of Engineers in Regional Networks. Management Science/Vol. 45, No. 7, July 1999
6. Sheng Wang, Raymond A. Noe (2010). Knowledgesharing: A review and directions for future research, Department of Management, University of Nevada, Las Vegas, 4505 Maryland Parkway, Las Vegas, NV 89154, United States
7. Solomon, R., Sandborn, P., & Pecht, M. (2000). Electronic part lifecycle concepts and obsolescence forecasting. IEEE Trans. on Components and Packaging Technologies, 23(4), 707-713.
8. US Department of Commerce. (2003). Education and training for the IT workforce. Report to Congress from Secretary of Commerce, accessed May 10, 2005, available at <http://www.cio.gov/documents/ITWF2003.pdf>.



## COMBINED EFFECTS OF THE FORMAL FINANCE AND FIRM CHARACTERISTICS ON SMES GROWTH IN SOKOTO STATE, NIGERIA

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### ABSTRACT

*This study investigates the effect of formal finance (micro-credit) and firm characteristics (firm age and sector affiliation) on the growth of Small and Medium Enterprises in Sokoto State. The survey is cross-sectional where availability and purposive sampling methods were used. A sample of two hundred and forty SMEs who have received micro-credit and operates for at least ten (10) years was employed. However, data on credit received from the banks over the period and the trend of change in turnover of the SMEs. It is discovered that micro-credit and firm characteristics such as firm age have a significant statistical relationship with the growth of the enterprises. It's against this background that this study recommends that government at all levels should venture into the provision of adequate infrastructures for SMEs operation. However, government should also provide adequate financial support, as earlier planned by the federal government in Nigeria, to microfinance banks to have the financial power to support SMEs operations.*

### KEYWORDS

Enterprise age, Micro-credit, Microfinance, Sector affiliation, SME growth.

### 1. INTRODUCTION

It has been noted that, a giant stride to support SMEs through the creation of an enabling environment and institutional structures for SMEs growth in Nigeria could be traced from the launching of the new Microfinance Policy, Regulatory and Supervisory Framework (MPRSF) in December, 2005. According to Abiola (2011), the policy is meant to address the problem of lack of access to credit by small business operators and interestingly the microfinance arrangement has made it possible for the Micro, Small and Medium Enterprises (MSMEs) secure credit from Microfinance Banks (MFBs) and other Microfinance Institutions (MFIs) on easier terms. Under meticulous supervision of the Central Bank of Nigeria, the Microfinance Institutions provide a wide range of financial and non-financial services to small and medium entrepreneurs, loans, savings mobilization, micro-insurance, money transfer and financial education. However, considering the importance of the scheme and specifically the role of SMEs in economic development, attempts have been made by scholars at various times to assess the impact of micro-credit for the growth of SMEs in Nigeria. In fact, mixed results have been found. Some studies conducted in Nigeria by scholars such as Babagana (2010), Idowu (2010), Suberu, Aremu and Popoola (2011), Oni, Imam and Ormin (2012) and Moruf (2013) discovered that access to credit affects SMEs growth while other researchers such as; Olutunla and Obamuyi (2008), Babajide (2012), and Olusola (2012) revealed that access to credit has no influence on the growth of SMEs. Results from the studies conducted in many countries including Nigeria have also shown that factors other than finance; such as firm characteristics, have strong influence on the growth of small business enterprises. However, it is against this backdrop that this study seeks to assess the combined effects of access to finance and firms' characteristics on the growth of firms in Sokoto State. To achieve this, the paper is structured to present a literature review after this little introduction, the research methodology, data presentation and analysis, discussion of results, conclusion and lastly the recommendations.

### 2. LITERATURE REVIEW

Firm growth has been described as the rate of expansion as measured by sales volume experienced by a firm during its initial years. In other words, the growth of firm has also been defined as an increase in a firm's size. Firm size can be described as the capacity or the structure of the enterprise. The indices to measure the size of the firm are numerous and a qualitative or quantitative improvement in such structure is usually considered as a firm growth. Tihula (2004) states that firm growth can be measured, for example, by sales volume, increase in the number of employees, increase in number of customers, subcontractors, products or innovations, and increase in market share. It has also been argued that the concept of enterprise growth connotes the developmental process of an enterprise with a sustained balanced and stable growth of total performance level (including output, sales volume, profit and asset growth) or keep recording enhancement of total performance and the stage spanning of developmental quality and level.

In the words of Nitcher and Goldmark (2005), the concept has been described as an increase in the number of employees overtime. They argued that the majority of studies on small enterprise growth employ this metric. Some scholars use alternative metrics such as revenue or asset growth. The majority of researchers studying small business growth in developing countries relies on employment growth because it is often extremely difficult to obtain reliable financial data from small firms. Nitcher and Gold mark (2005) stressed that even when Micro and Small Enterprise owners do not keep written records they can usually recall their number of employees. However, Vega (2010) posited that the growth of MSEs can be measured in different ways, such as growth in sales, increase in the number of workers or increment in profits. McPherson (1996) opined that growth in terms of sales or profits might be preferable to a labour-based measure from an accuracy standpoint", given that measurement is not an obstacle when data is available.

Storey (1995) adumbrated number of factors influencing the growth of small enterprises as the entrepreneur/resources, firm itself and the strategy used by the entrepreneur. Sebstad, *et al.* (1995) in Abdul (n.d.) argues that there is a different range of indicators of growth of SMEs but, for the purpose of his study, Abdul (n.d.) propose to use the income of the MSEs, accumulation of business assets, revenue and employment as an indicator of growth for the enterprises. However, Delmar *et al.* (2003) argues convincingly that since there appears to be no one best measure of firm growth, as well as no one best composite measure of firm growth, it would be advantageous to explore the use of many different growth measures in a study of firm growth. The use of multiple measures of firm growth would likely provide a more complete picture of any empirical relationships as well as provide a way to test the robustness of any theoretical model to misspecifications in the dependent variable. The use of multiple measures also offers the opportunity to use a measure optimized to the study's specific purposes while allowing comparisons with the results of previous studies using other growth measures. In fact, it adopts in view of this study the method of measuring combined effects of composite variables to identify the relevance of each in enhancing the growth of an enterprise and also ascertain the degree of influence of each on the established growth. The factors selected in this study were earlier reported to have a positive relationship with SMEs growth in different

researches. Example, even though other measures have been described but specifically finance and firm characteristics were also listed among the influential factors that caused firm growth.

Even though, loan have been said to have greater influence of firm growth, records show that other factors are also critical in the determination of firm growth. This has been confirmed by Rabbani and Sulaiman (n.d.) who pointed out that SME loan is not the only factor behind the growth of business. Heshmati (2001) in Naqeeb (2012) further argues that firm size and age are the determinants of growth and even the firm characteristics such as ownership and capital structure, R&D, human capital and export activities can play important role in firm growth. Aw (2002) posits that firm age and productivity (TFP) have a positive relationship because older firms have experience in production and have already been exposed to competition from other firms. However, some researchers stated that firm growth (i.e. An increase in employment) can be negative for older firms compared to younger firms because old firms may fail to invest in existing technologies or emerging technologies and this might reduce the productivity of old firms; put in another way if young firms are better in technology and resources, then age and productivity may have a negative relationship (Nichter and Goldmark, 2005).

In a research conducted (in Nigeria) to assess the contributions of Microfinance Institutions (MFIs) to the sustainable growth of SMEs, Oni, Imam and Ormin (2012) reports that data were collected from 360 randomly selected SMEs using the questionnaire instrument. The analysis revealed that MFIs does and could contribute to the sustainable growth of SMEs in the country. However, Babagana (2010) conducted a study to examine the impact of the role played by microfinance banks (MFBs) in promoting the growth of SMEs in Nigeria using Garu Micro Finance bank in Bauchi, Bauchi State. Out of the total number of employees in the bank, 15 members of staff whom constitute the middle management and staff were used as respondents. A questionnaire was developed and distributed to them which they all filled and returned. The study revealed that MFBs have contributed to the promotion of small and medium enterprise growth in Nigeria.

A survey conducted by Idowu (2010) also addressed the issue of goal achievement using microfinance loans. None of the respondents however claimed that MFIs loans did not contribute at all to their sales and marketing activities. The results clearly show that access to MFIs loans have contributed to SMEs performance no matter how little. However, Suberu, Aremu and Popoola (2011) found that a significant number of small scale businesses benefited from MFIs loans even though very few of them were suitable and secured the required amount applied for. Interestingly, the majority of small scale enterprises acknowledged positive contribution of microfinance institution's loan toward promoting their market excellence and overall economic company competitive advantage. Whereas in a recent study to evaluate the effectiveness of credit administration of the Nigerian Microfinance Banks on the operations of selected SMEs in Osun State, Nigeria by Moruf (2013) the overall result of data analysis and hypothesis testing showed a statistical significant relationship between MFBs credit and SME performance at 5% significance level.

On the contrary, some studies conducted have discovered poor or no relationship between microfinance bank credit and SMEs growth. Babajide (2012) employed a panel data and multiple regression analysis to analyze the data from a survey of 502 randomly selected enterprises financed by microfinance banks in Nigeria. The study found strong evidence that access to microfinance does not enhance growth of micro and small enterprises in Nigeria. However, other firm level characteristics such as business size and business location, are found to have a positive effect on enterprise growth. These findings confirmed the views expressed by Olutunla and Obamuyi (2008) that the growth of SMEs is not just dependent on accessing bank loan but accessing the right size of loan at the right time. The insignificant position of the overall *F*-statistic led the decision to accept the null hypothesis for the three samples, which implies that microfinance does not enhance the expansion capacity of small business in Nigeria. In that study, variables such as technology, training received by the entrepreneur, business location, business age and business registration in that order are the variables that impact significantly on small business growth, none of the micro finance variables were found to have significant impact on small business growth for small firm sample. The result also revealed that variables such as owners' education, loan interest, duration of asset loan, business location, technology related training received and size of asset loan, all impact significantly on micro firm growth but the magnitude of the beta coefficient of micro finance variables are so small. However, in a study conducted to analyze the performance of Microfinance Banks of Women entrepreneurs in Oyo State, Nigeria, Olusola (2012) observes that the performance of women entrepreneurs who participated in micro-credit programme did not significantly improved due to high interest rates and short repayment periods.

### 3. RESEARCH METHODOLOGY

This research is a cross-sectional and time series research. It captures ten year records of SMEs in terms of some specific variables that enable the researcher to study some trends and measure growth of the firms from distribution, agriculture, manufacturing, service and processing industries. However, in this study the annual turnover of SMEs under study constitutes the measure of business growth (proxy of the dependent variable) where access to micro-credit (cash and value of assets received from MFBs), age of the enterprise and sector affiliation of the SMEs are the independent variables. The population of this study is the total number of SMEs served by microfinance banks in Sokoto State. In fact, due to the difficulty in covering the entire population, considering their large number and also time constraint, fair representation of the population becomes imperative. In view of this, a total number of two hundred and forty (240) SMEs have been drowned for this study through stratified and availability sampling methods.

To ascertain the number of SMEs served by the five (5) registered microfinance banks, the research relies heavily on the records available in the banks and the distribution of seven thousand two hundred and seventy SMEs across the banks. The instrument used for the collection of data for this study is basically a questionnaire for the SMEs operators and Focus Group Discussion. Questions in this questionnaire are presented in both open-ended and close-ended formats.

A pilot study was also conducted to test-run the practicability of the study and to detect flaws in the data collection process. This was primarily aimed to determine reliability of the instrument. Copies of the questionnaire were given to senior colleagues, Microfinance Bank managers and postgraduate students. The views of the bank managers because they closely relate to SMEs operators and they know better ways of measuring their performance and constraints. Forty (40) copies of the questionnaire were used for the pre-testing.

Analysis of data for this study was carried out using inferential statistical technique which embodies the use of multiple regression with the aid of Stata 12.0 as an analytical tool. However, it has earlier been mentioned that this study comprises both dependent variable and independent variables whose nature of relationships is established by the research. Hence, the design of the research examines the relationship on a regression.

Format of:

$$Y = a + \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e_{it} \quad (\text{eq. 1})$$

Where, Y= is the dependent variable (SMEs growth)

$a$  = Intercept

$\beta$  = Slope

$X_1$ - $X_3$ =Independent variables

$X_1$ = Access to micro-credit measured by amount of money and value of materials received by SMEs operators/owners from microfinance bank.

$X_2$ = A firm characteristic- Enterprise age measured by numbers of years an SME existed.

$X_3$ = A firm characteristic- sector affiliation measured by the sector in which business belongs.

Y= as a statistic of Business growth measured by change in annual turnover

SME Growth as a function of micro-credit, Enterprise age, and Sector affiliation of the business are represented thus:

$$\text{SME growth} = f(\text{micro-credit, enterprise age, sector affiliation}) \quad (\text{eq.2})$$

SME growth is translated by a significant increase in turnover resulting from access to micro-credit, age of the enterprise and the sector affiliation of SMEs.

$$\text{SME Growth} = f(\text{Mcred} + \text{Entage} + \text{Secaffl}) \quad (\text{eq.3})$$

The equation shows the relationship between a dependent variable firm growth (Proxies by change in turnover) and independent variables i.e. Micro-credit and firm characteristic such as; enterprise age and sector affiliation.

**Hypothesis:** Positive relationship does not exist among Micro-credit, Firm characteristics and SMEs growth in terms of turnover.

This hypothesis has been tested with the following regression equation.

$$\text{Logturnover}_{it} = \alpha + \beta_0 + \beta_1 \text{Mcredit}_{it} + \beta_2 \text{Entage}_{it} + \beta_3 \text{Secafflit}_{it} + \epsilon_{it}$$

(eq. 4)

Where  $\text{turnover}_{it}$ ; Turnover

$\alpha$  = Intercept

$\beta$  = Slope of the intercept

Mcred = Micro-credit

Entage $_{it}$  = Enterprise age

Secafflit = Sector affiliation

$\epsilon_{it}$  = Error level

The Hypothesis was tested on the models above using multiple regression analysis. The choice of regression to test hypothesis was based on the need to analyze the relationships between dependent variable and independent variables and thereby establish the extent to which independent variables influence the dependent variable. However, in this study, a Pooled OLS is used as a rough and ready means of analyzing the data. It is said to be a simple and quick benchmark to which more sophisticated regressions can be compared. Since our data is in Panel form, we consider more general models than the simple pooled OLS model. The models chose for further regression tests are fixed effects and random effects techniques.

To follow the normal procedure, we run some decisions tests after each regression test in order to choose the best result among the alternative test going by a given criterion of selection. These include Hausman test for fixed effect and Breushch-Pagan Langrangian Multiplier test for random effects.

The equation for the fixed effects model is as follows;

$$Y_{it} = B_1 X_{it} + \alpha_i + U_{it} \tag{eq. 5}$$

Where

- $\alpha_i$  ( $i = 1, \dots, n$ ) is the unknown intercept for each entity (n entity-specific intercept)
- $Y_{it}$  is the dependent variable, where  $i$  = entity and  $t$  = time
- $X_{it}$  represent one independent variable
- $B_1$  is the coefficient of the independent variable
- $U_{it}$  is the error term

However, the equation for the random effects model is as follows;

$$Y_{it} = B_1 X_{it} + \alpha + U_{it} + \epsilon_{it} \tag{eq. 6}$$

Where

- $\alpha$  the intercept
- $Y_{it}$  is the dependent variable, where  $i$  = entity and  $t$  = time
- $X_{it}$  represent one independent variable
- $B$  is the coefficient of the independent variable
- $\epsilon_{it}$  is the error term

To follow the normal procedure, we run some decisions tests after each regression test in order to choose the best result among the alternative test going by a given criterion of selection. These include Hausman test for fixed effects versus random effects and Breushch-Pagan Langrangian Multiplier test for random effects versus Ordinary Least Square (OLS).

To decide between fixed effects and random effects, you can run a Hausman test where the null hypothesis is that preferred model is fixed effects. It basically tests whether the unique errors ( $U_i$ ) are correlated with the regressors, the null hypothesis is they are not. If the result of the Hausman test shows  $\text{Prob} > \chi^2$  is  $< 0.05$  use fixed effects.

However, in a decision to choose between random effects and a simple Ordinary Least Square (OLS), the Breusch-Pagan Lagrange Multiplier test is carried out. The null hypothesis is that variances across entities is zero, this is no significant difference across units (i.e. No panel effect). If  $\text{Prob} > \chi^2$  is less than 0.05, and then the random effects model is preferred since there is evidence of differences across entities.

#### 4. DATA PRESENTATION AND ANALYSIS

TABLE 4.1: REGRESSION RESULTS ON THE SMES GROWTH IN TERMS OF TURNOVER

Tover	OLS			FE			RE		
	Coef.	Std. Err.	P >  t	Coef.	Std. Err.	P >  t	Coef.	Std. Err.	P >  t
mcred	.8635994	.067319	0.000	-.1711257	.057827	0.004	.1784583	.0616595	0.004
Entage	-.8036781	.2595008	0.002	1.25778	.2159742	0.000	.3138598	.2301031	0.173
secaffl	-.0872468	.3077614	0.777	-.2376193	.1842139	0.199	-.0601923	.2160503	0.781
-Cons	5.419431	1.258755	0.000	13.34018	.7929696	0.000	11.15315	.9328051	0.000
R <sup>2</sup>	0.4906			0.3078			0.2963		
Rho				.9746058			.92046454		
F Statistic				0.0000					
Wald chi2							11.80		
Hausman				-3357.99					
Breusch-Pagan							0.0000		

Source: Stata 12.0 outputs

Note: \*\*\*, \*\*, \* denote 1%, 5% and 10% significance levels respectively

Table 4.1 above, presents results from pooled OLS, fixed effect and random effect. The OLS regression result shows the relationships among microcredit, firm characteristics and SMEs turnover. In that relationship, microcredit has  $\beta = .8635994$  which shows that every one naira increase in credit accessed by the SMEs, 80 kobo. The Standard error .067319 and p-value = 0.000 have also been recorded. Since the 0.000 being the p-value is less than 0.05 preset alpha, it indicates that microfinance has positive significant relationship with turnover at 1% significance level. About enterprise age and turnover of SMEs, coefficient of  $\beta = -.8036781$ , standard error .2595008 and 0.002 being the p-value the result explained that relationship exists between enterprise age and turnover of SMEs at 5% level of significance. Still in the first column of the same table, however, the OLS regression results show the relationship between sector affiliation of the enterprises and turnover with  $\beta = -.0872468$ , standard error .3077614 and p-value = 0.777. This shows that positive statistical relationship does not exist between these variables. In the OLS result the R square = 0.4906.

On the same table (table 4.1) in the second column, regression results from the fixed effect model shows the relationships among microcredit, firm characteristics and turnover of the SMEs. In that relationship, microcredit has  $\beta = -.1711257$ , the standard error = .057827, and p-value = 0.004. Since the 0.004 being the p-value is less than 0.05 the alpha, it indicates that microfinance has a positive significant relationship with turnover at 5% significance level. On enterprise age and turnover of SMEs, however, the fixed effect model has a coefficient of  $\beta = 1.25778$ , the standard error = .2159742 and 0.000 being the p-value, the result explained that the positive statistical relationship exists between enterprise age and the turnover of SMEs. However, results in the above table also show the relationship between sector affiliation of the enterprises and turnover.  $\beta = -.2376193$ , standard error = .1842139 and p-value = 0.199. This shows that relationship does not exist between these variables. The R square achieved was 0.3078 and the intra class correlation (rho) shows that 97.4% of the variance is due to differences across panels. The results also show F Statistic = 0.0000 which indicates that the model is okay.

Interestingly, in the third column of table 4.1 the random effect model presents entirely different results from the random effects model. Results from the table indicate that micro-credit has  $\beta = .1784583$ , standard error = .0616595 and p-value = 0.004. Since the p-value (0.004) is less than 0.05 alpha, it indicates that microfinance has a positive significant relationship with turnover at 5% significance level. However, enterprise age and turnover of SMEs, coefficient of  $\beta = .3138598$  was recorded, standard error = .2301031 and 0.173 being the p-value. The result explained that the statistical relationship does not exist between enterprise age and the turnover of SMEs. In this model the R square = 0.2963 and the intra class correlation (rho) shows that 92% of the variance is due to differences across panels. The Wald Ch2 which show whether the model is ok is 11.80 which is greater than 0.05 alpha level.

To decide between fixed and random effects the Hausman test has been run where the null hypothesis suggests that preferred model is a random vs. alternative the fixed effects. It basically tests whether the unique errors are correlated with regressors, the null hypothesis is they are not. The result in table 4.1 above shows -3357.99 which signifies that model fitted to these data fails to meet the asymptotic assumptions of the Hausman test. However, the decision to choose between random effects and simple OLS informed the decision to run the Breusch-Pagan Lagrange multiplier (LM) test. The null hypothesis in the LM test is that variances across entities are zero. The LM test shows the Prob > chi2 = 0.0000 which indicates that the random effects model is also appropriate. Based on the fixed effects results the null hypothesis that positive relationship does not exist among Micro-credit, Firm characteristics and SMEs growth in terms of turnover is hereby rejected.

## 5. DISCUSSION OF RESULTS

The regression results from the fixed effect model show the relationships among micro-credit, firm characteristics and turnover of the SMEs. In that relationship, micro-credit has a positive significant relationship with turnover. When credit is accessed by SME operator the turnover of the enterprise significantly increases. This is however, resulted from the increase in the capacity of the enterprise to acquire more factors of production and increase labour and output. On the enterprise age and turnover of SMEs, however, the fixed effect model shows that a positive statistical relationship exists between enterprise age and the turnover of SMEs. It is gathered that business experience help firms to expand their market share through promotional activities over time. Aw (2002) posits that firm age and productivity (TFP) have positive relationships because older firms have experience in production and have already been exposed to competition from other firms. However, results in table 4.1 also show the relationship between sector affiliation of the enterprises and turnover. The result shows that relationship does not exist between sector affiliation and turnover. It shows that a sector which an SME belong does not determine the growth of the enterprise. A firm can grow or fail to grow in whichever sector it falls depending on their effort and situation. In the overall, the null hypothesis that positive relationship does not exist among Micro-credit, Firm characteristics and SMEs growth in terms of turnover is hereby rejected. The failure to accept the null hypothesis was due to the decision criteria where the p-value was less than the critical value even though only micro-credit and age of the enterprises are positively related to the firm growth.

## 6. CONCLUSIONS

Formal finance is said to have more influence on growth of SMEs than enterprise age. However the sector affiliation of the SMEs is not a determinant of firm growth. These findings are not controversial since similar results have been reported in various researches. The result is also in line with the Pecking Order theory which categorically associate external finance with firm performance. The findings of this study are in consonance with Bekele and Zeleke (2008), Shinozaki (2012), Quaye (2011), Babagana (2010), Idowu (2010), Aremu and Popoola (2011), Oni, Imam and Ormin (2012) and Moruf (2013) among others. It has been earlier reported that Kuntchev, *et al.* (2012) concludes that not only in the developing countries rather, Small and Medium Size Enterprises (SME) are the most common employers across the world. Furthermore, Shinozaki (2012) argues that SMEs are a driving force of economic and social stability due to their quantitative impact on the national economy and the empirical effects of creating jobs, fostering a competitive business environment, and expanding the industrial base. However, since, according to many reports, SMEs are predominantly the key players in the economic activities of developing nations and In Nigeria, Odeyemi (2003) in Lemuel (2009) confirmed that an estimate of about 70% of the industrial employment is held by SMEs and more than 50% of the Gross Domestic Product is SMEs generated, the result of this study clearly show that SMEs in the study area have a positive contribution to the economic development. This also indicates that the government can use SME financing as a means of boosting commercial activities, employment generation and overall economic development.

## 7. RECOMMENDATIONS

The recommendations are based on the problems affecting SMEs in the area as confirmed through Focus Group Discussion.

- i. Microfinance banks should assess the demand of SMEs applying for credit facility and grant required amount that could finance the business even if it entails giving higher than what the SME applies for.
- ii. Since the SMEs opined that interest charges do not affect growth of their businesses the bank should maintain the interest rates and tax bodies should also maintain the tax rate since the amount charge is not considered high by the tax heads. However, since SMEs associated lack of business support services with poor growth of their enterprises government should continue to partner with donor agencies to provide regular training and development and business counseling to SMEs operators through an organized scheme in order to enhance growth of the SMEs.
- iii. On the issue of poor and inadequate infrastructure being among the factors affecting the growth of SMEs government have a critical role to play. In Brazil, government support the activities of SMEs by providing industrial areas, linking areas with roads, electricity, water, energy and other facilities to make business easy. In Nigeria, government at all levels should venture into the provision of adequate infrastructures for SMEs operation. However, government should provide adequate financial support, as earlier planned by the federal government in Nigeria, to microfinance banks so as to have the financial power to support SMEs operations by giving them adequate credit facilities. A conducive business environment is also said to be a critical factor in the enhancement of growth of SMEs. In Nigeria, issue of insecurity and corruption affects the smooth running of businesses. Government should pay attention in providing secure business environment in which SMEs can strive. The law should also protect the SMEs in their course of operation and businesses should be sensitized, part of business advisory services, the way and manner they can protect their business entities from corruption through complying with legal procedure in the course of their business.
- iv. SMEs especially those that are making a reasonable income should take the human resource as a critical factor that can facilitate the achievement of the objectives of the organization and business growth. Organizations should give priority to the recruitment of qualified manpower whose services are required and that can easily move the enterprise forward. However, since SMEs confessed that competition has negative effects on the growth of SMEs in the area, the quality of their products and fair pricing are the measures to help SMEs make relevance in a competitive atmosphere. However, to contain the problem of poor sales caused by economic condition SMEs should properly manage the quality of their products, remain competitive in terms of pricing, advertise their products and establish proper channels of distributing their products. Even though the result did not associate incessant withdrawal of money for unproductive use with poor SMEs growth, still the business owner should remain cautious in withdrawal. They should keep the withdrawal within the reasonable level to avoid eating up the whole profit and later in the capital. Operators should devise a way of refunding whatever they withdraw to avoid capital squeeze.

## REFERENCES

1. Abdul, A, n.d., Impact of microfinance Institutions on Growth of Micro and Small Enterprise and Owners in Tanzania, a PhD Proposal Submitted to the University of Dar es Salaam Business School.
2. Abiola, B.A, 2011, Effects of Microfinancing on Micro and Small Enterprises (MSEs) in South-West Nigeria, a Ph.D Thesis Submitted to the Department of Banking & Finance, Covenant University.

3. Babagana, SA, 2010, Impact Assessment of the Role of Microfinance Banks in Promoting Small and Medium Enterprises Growth in Nigeria, *International Journal of Economic Development Research and Investment*, Vol. 1, (1), P 23.
4. Babajide, A, 2012, Effects of Microfinance on Micro and Small Enterprises (MSEs) Growth in Nigeria, *Asian Economic and Financial Review*, Vol. 2 (3), Pp. 463-477.
5. Bekele, E & W. Zeleke, 2008, Factors that Affect the Long-Term Survival of Micro, Small and Medium Enterprises in Ethiopia, *South African Journal of Economics*, Vol. 76 (3), Pp 1-33.
6. Delmar, F, Davidson, P, & Gartner, WB, 2003, Arriving at the High Growth Firms, *Journal of Business Venturing*, Vol.18, Pp 189-216: <http://eprints.qut.edu.au>.
7. Idowu, FC, 2010, "Impact of Microfinance on SHs in Nigeria". Proceedings of the International Conference on Innovation and Management, School of Management, Wuhan University of Technology, Wuhan, China.
8. Kuntchev, V, Ramalho, R, Rodríguez-Meza, J, & Yang, JS, 2012, What Have We Learned from the Enterprise Surveys Regarding Access to Finance by SMEs?: <http://www.jmsrh.org/157/>
9. McPherson, MA, 1996, Growth of Micro and Small Enterprises in Southern Africa, *Journal of Development Economics*, Vol. 48, Pp. 253-277.
10. Moruf, O, 2013, Evaluation of Nigerian Microfinance Banks Credit Administration on Small and Medium Scale Enterprises Operations, *International Review of Management and Business Research Journal*, Vol. 2 (2), June, P505.
11. Naqeeb, UR, 2012, Relative Performance of SMEs: a Case Study of Software Firms in Islamabad/Rawalpindi regions, PhD thesis Submitted to Department of Economics, University of Glasgow: <http://theses.gla.ac.uk/3697/>.
12. Nitcher, S, & Goldmark, L, 2005, Understanding Microenterprise Growth. Report for Review by the United States Agency for International Development, Prepared by Development Alternatives, Inc.
13. Obamuyi, TM, 2007, An exploratory study of loan delinquency among small and medium enterprises (SMEs) in Ondo State of Nigeria. *Labour and Management in Development, African Journal of Business Management* Vol.2 (x), Pp. 195-200.
14. Obamuyi, TM, 2011, Comparative Loan Performance in Banks And Micro-Credit Institutions Nigeria: a Case Study Of Ondo State, *Global Journal of Management and Business Research*, Volume 11 (4), Pp 46.
15. Odebiyi, OC & Olaoye, OJ, 2012, Small and Medium Scale Aquaculture Enterprises (SMES) Development in Ogun State, Nigeria: The Role of Microfinance Banks, *Libyan Agriculture Research Center Journal International*, Vol. 3 (1): Pp1-6.
16. Odeyemi, J.A., 2003 "An Overview of the Current State of SMEs in Nigeria and the Need for Intervention". A Paper Presented at the National Summit on SMIEIS Organised by the Bankers' Committee and Lagos Chambers of Commerce, June, 2012.
17. Olusola, AO, 2012, Performance Analysis of Micro-Finance Banks on Women Entrepreneurs in Oyo State, Nigeria, *Research Journal in Organizational Psychology & Educational Studies*, Vol. 1(3), Pp 168-173: <http://www.emergingresource.org>.
18. Oni, EO, Imam, IP & Ormim, K, Assessment of the Contribution of Micro Finance Institutions (MFIs) to Sustainable Growth of Small and Medium Scale Enterprises (SMEs) in Nigeria, *Interdisciplinary Journal of Contemporary Research in Business*, Vol, 3, (9), Pp 24-38.
19. Quaye, DNO, 2011, The Effect of Micro Finance Institutions on the Growth of Small and Medium Scale Enterprises (SMEs); a Case Study of Selected SMEs in the Kumasi Metropolis, a Master's Thesis submitted to the Institute of Distance Learning, Kwame Nkrumah University of Science and Technology.
20. Rabbani, M, & Sulaiman, M, n.d., Financing SMEs and its Effect on Employment Generation: a Study of Brac Bank's SME Lending, Research and Evaluation Division: <http://www.bracresearch.org>.
21. Sebestad, S, & Walsh, M, 1995, Microenterprise and Its effects in Kenya: an exploratory study, Report prepared for USAID AFRIMDI and S & T/W1D, Coopers and Lybrand, Washington D.C.
22. Shinozaki, S, 2012, A New Regime of SME Finance in Emerging Asia: Empowering Growth-Oriented SMEs to Build Resilient National Economies, ADB Working Paper Series on Regional Economic Integration, No. 104, December.
23. Storey, D, 1994, *Understanding the Small Business Sector*, London, Routledge.
24. Tihula, S, 2004, "Management Teams and SME Performance," Paper Presented at NCSBS Postdoctoral Conference, University of Kuopio, Tromso, Norway, June.
25. Vega, CS, 2010, Micro and Small Enterprise Development in Bolivia; Seeking Opportunities, a Master's Dissertation Submitted to Lund University.

**IMPACT OF TELEVISION ADVERTISEMENTS ON BUYING BEHAVIOUR OF TEENAGERS: AN ANALYSIS**

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**ABSTRACT**

Television advertising plays an important role on changing the consumer behavior and also provides new patterns for purchasing or using any type of product. Advertising is the most influential and powerful medium in the society. The main objective of this study was to find out, how television advertisements influenced teenagers. The present study was used exploratory cum descriptive design. Convenience sampling has been used. A sample of 150 respondents has been used for collecting the response through well structured questionnaire. The sample selected for this study includes the students of Hanumangarh district of Rajasthan State. The students consist of boys and girls belonging to the age group of 12 to 18 years. Secondary data was also collected from different previous research studies, including several journals, articles, books, newspapers etc. A set of simple techniques of statistical analysis such as mean, standard deviation has been used. Further, ANOVA and Factor analysis was used. It can be concluded that majority of the teenagers are male in the age group from 15 to 18 years affected from the television advertisements. It was found that teenagers differs their opinions towards parents to buy those products as they watched in television advertisements. Television advertisements forced the viewers to buy the products and urge them to try the brand. Further, it is also found that the habit of watching television for long time causes overweight among the teenagers. Moreover, they are attracted by costly branded products shown in advertisements in the media. They also share their shopping experiences with their family members. Therefore, it may be recommended that the producers or marketers should frame ethical advertising strategies keeping in mind the health and social impact among the teenagers.

**KEYWORDS**

advertising, purchasing, society and branded products.

**INTRODUCTION**

Advertising creates and sustains an ideology of consumption and it is a social force affecting Indian homes today. Advertising is the function of mass communication. All productivity relies on this medium of mass communication. Advertising diffuses information about commodities, markets them and persuades the common man of their place in his life. It plays a role in social change. It celebrates change and internalizes change for those who become better by using a certain product/service. Advertising, though originally used to market products, now, unfortunately, it seems to market feelings, sensations and styles of life; an amazing 'revolution in manners and morals'. All this has been possible through an efficient communication network which has revolutionized changes. The first impact that one gets from the advertisement is that the viewers have no choice of their own in making preference for the consumer goods they want to use in daily life. The advertisement imposes choices and preferences on the public mind through language, conversation, jingles, etc. This kind of aggression on the minds of the people, coming from different strata of the society, can create disturbances on traditional way of life of some category of people. In the long run, it is likely that social and cultural transformations of revolutionary nature are created in the society through such programmes. On the credit side, advertising has speeded the introduction of useful inventions. It has spread markets, reduced the price of goods, accelerated turnover and kept people in employment. Advertising in India has created an incredible awareness among the people in the past decade growing into big industry. It was grown along with the press and today it has found its way into the other two media - Radio and Television. At the moment, the media in order to earn revenue through advertising are implicated in creating a market for consumer goods. Though it is largely an urban phenomenon, the same commercial advertisements on television reach rural areas and can have disturbing effects on rural people, where wants are encouraged, whose appetite for luxury goods and services is sharpen. This can lead to a sense of frustration among those who cannot afford them. Advertising in India has played a vital role in the development process by creating a demand for consumer goods and raising the living standards of millions. A substantial amount of advertising expenses are utilized on advertisements of capital goods, intermediaries, consumer durables and services, most of which promote investment, production and employment. Further, advertising has a definite role to play in rural development, and Indian advertising has made some progress in this direction as well. The total online advertising market in India, comprising search, display, mobile, social media, email and video advertising was valued at INR 1,750 Crores in 2011-12 and has grown to INR 2,260 Crores in 2012-13. It is projected that by 2013-2014, the size of the online advertising market in India will be INR 2,938 Crores. On an average, the online advertising market has been growing at 40 per cent year-on-year basis from 2010-2011 to 2013-2014.

**REVIEW OF LITERATURE**

**Gayatri and Gaur (2012)** carried a study on impact of television advertisements on teenagers. Advertising is giving the general public information about new product and trying to increase overall sales. Teenagers have become top consumers in today's society so advertisers have focused on getting their business is very much apparent. Television makes a big impression on young minds. Sample was taken from different regions of Delhi and NCR on the basis of purposive sampling technique. Primary data was collected with the help of questionnaires. The results of the study showed that the role of television advertisement is very important in influencing the behavior of teenagers. Marketers are trying and focusing to attract and influence the teenagers by designing advertisements that are considerably attractive for youth and persuasive enough for their emotional attachment with the product. The findings revealed that television advertising affects the youth's cognitions, attitudes and behaviors. If the adolescents acted as selling agents for the sellers of advertised products then it shows the significant relationships between the frequencies of viewing such advertisements and youth's relative participation in consumer decisions. Advertisement also influences their buying decision while shopping. They also like to buy new products when they see television advertisements. More over if some popular celebrity has advertised any product; the chances of increase in demand of that product also raise high. The study has great importance for marketers involving in positioning and advertising.

**Singh and Kaur (2011)** examined to know the attitude of parents towards the advertisements aimed at children and parent's buying behaviour. It found that several companies have exclusive deals with leading fast food and soft drink companies to offer their products in a school or college. There is competition among

marketers to grab the consumer's attention. In order to attract children special discounts are offered and children are greatly influencing parents to spend on products of their choice. Both primary as well as secondary data were used in the present study. The variables were studied through field survey. It also found that significance level is greater in most of the perceptions of parents regarding the impact of advertisements on children. This happens because of different mindsets of persons belonging to different occupations. The parents in service can provide more time to their children than the parents in business and the professional parents can guide their children in a skilled way as they are well versed with the criticality of the impact of advertisements. The results of the study reveal that children are rational enough to evaluate advertisements and they have extensive influence on parents to buy the products. There is a significant impact of television advertisements on children and the buying behaviour of their parents. So the manufacturers should provide all information to young consumers to make judgments.

**Haroon, et al. (2011)** examined that advertisement plays major role in informing about the products and services to the target market. Children are becoming more focus target market for many advertisers and put their efforts to capture this market. Most of the advertisers are advertising those food products which have above the standard level fats, more calories and salt such as confectionery, soft drinks, crisps and savory snacks, fast food and pre-sugared breakfast cereals are included in the daily lives of the children. The study intended to check advertisements on television and food using pattern of children. The study conducted in two parts. In first part, content analysis of television advertisement, which during the child programs on Saturday and Sunday were examined. The second part of the study focused on children's behaviour while watching television advertisement and their purchasing request during shopping. It was found that children in the age group of 4-5 years showed attentive behavior than other children. Children asked their parents to buy the products presented in the advertisements and bombarded with so many advertisements. It creates problems to parents to buy these unhealthy products. It concluded that television advertisements affected children's food choices and health. So, the behaviour of the children was more influenced by the television advertisements.

**Pongiannan (2011)** investigated that the viewer's preference of television advertisements and the form of advertisements that the viewers prefer on television. It found that identification of new sales promotional strategy through measuring the viewer's perception towards the different advertisement on television media is useful. This is highly significant for the marketer and advertisers as a good sales promotional strategy. A well structured questionnaire was used to collect the data. The geographical area of Coimbatore city was chosen. Random sampling as well as snowball sampling technique was used to select the respondents. The data collected through questionnaire were analyzed using frequency analysis, Chi-square test and Friedman-two-way ANOVA. The perception of the audience towards the various functional forms of television advertisements, reasons for watching advertisement on television media, their reaction while the advertisements are shown in middle of their favourite programs and use of celebrities were captured and appropriately analyzed. It concluded that television is the single most preferred media for advertisements by respondents because of its various features. Easy understandability is the main reason for viewing advertisements on television media with reliable source of information, product description with conversation and background music enhance the importance of television media.

**Asadollahi and Tanha (2011)** found that prevalence of obesity in childhood is increasing worldwide. The reason for the childhood obesity is growth in television advertising. Advertisements in television increases demands of children from parents which results in parent - children fighting. Younger children than older children are at risk of complications acts. Apart from the conflict between parents and children, another problem is that kids spend their time in advertisements instead of playing with friends. Moreover children tend to imitate the movements of athletes or models which can be more dangerous. Television deals to broadcast program which can have profound effects on the developing world and the children to change their lives. The potential impact of the television spectrum can be put on young viewers. They are not aware that their behaviour and the behaviour of others are affected by television advertising.

**Singh and Sandhu (2011)** examined that impact of television commercials on the social and moral behavior of Indian viewers. The reach of television is widespread. Alcohol and tobacco advertisements increase their use by children and teenagers. The study was conducted in the state of Punjab in India. The sampling technique used was convenience sampling. A well structured questionnaire was used to collect the data and five-point likert scale used. With the help of a Regression Model, the influence of the factors was studied on the social and moral behavior of the viewers. The findings of the study showed that inappropriate television advertisements undermine social and religious values, negatively influence human behavior, consumer discontent and loss of confidence, purchase of goods against the will, taking loans beyond their repayment capacity, ready to commit crime and resort to corruption. Inappropriate television advertisements cause the deterioration of the moral fiber of the society. These advertisements show disrespect towards integrity of cultures and degrading women by diminishing their self-image and showing them as sex object. Advertisements directed at children and teenagers can adversely influence their behavior.

**Ashaduzzaman and Rehman (2011)** investigated that the impact of television advertisement on purchasing decision of women for acquiring goods and services. Television advertising plays an important role on changing the consumer behavior and also provides new patterns for purchasing or using any type of goods and services. It is the most convenient way to reach the female consumers because they are more deployed by advertisement promises that the product will give them something special for satisfaction. This study is based on a survey of 460 randomly selected women from three places in Dhaka City. The results reveal that advertisements play a vigorous role in familiarizing a new product in the family list and taking right decision during shopping. The respondents after watching television advertisement want to buy the new brand introduced in the market and are of the opinion that T.V. advertisements help them to make better choice during shopping.

**Priya, Baisya and Sharma (2010)** analyzed the impact of children's attitudes towards television advertisements on their resultant buying behaviour. The study was used exploratory and descriptive research design. The study was carrying out a survey of children in the age group 5 to 11 years, while they were in their class room. Questionnaires were used for data collection. The study found that the demand for the advertised products is heavily influenced by the children's attitude towards advertisements. Further, the cognitive changes among the different age groups lead to the formation of varying attitudes towards the advertisements. Yet there are other potent factors apart from advertisements, which result in the requests for a product or brand.

After, reviewing the existing literature it is observed that the above studies have considered different factors a lot. However, these studies are not focused upon Television advertisements on buying behaviour of teenagers. Therefore, the present study entitled "Impact of Television advertisements on buying behaviour of teenagers: An Analysis" may be conducted.

## OBJECTIVES OF THE STUDY

The objectives of the study are as under:

- (i) To know the impact of television advertisements among the teenagers; and
- (ii) To study the buying behaviour of teenagers;

## HYPOTHESES OF THE STUDY

The hypotheses formulated for the present study are as follows:

- $H_1$  : There is no significant difference among the teenagers towards the impact of television advertisements.
- $H_2$  : There is no significant difference among the teenagers buying behaviour.

## RESEARCH METHODOLOGY

The present study was used exploratory cum descriptive design. Convenience sampling has been used. A sample of 150 respondents has been used for collecting the response through well structured questionnaire. The sample selected for this study includes the students of Hanumangarh district of Rajasthan State. The students consist of boys and girls belonging to the age group of 12 to 18 years. Data was collected with the help of structured questionnaire. Secondary data was also collected from different previous research studies, including several journals, articles, books, newspapers etc. Furthermore, Internet is also used for gathering worldwide information. A set of simple techniques of statistical analysis such as mean, standard deviation has been used. Further, ANOVA and Factor analysis was used. A computerized package PASW (18.0 version) used.

**DATA ANALYSIS AND INTERPRETATION**

Table 1 depicts that 61 male and 45 female from 15-18 age groups. Table 2 shows that 69 respondents are agreed that they have seen the television advertisement and 69 respondents are agreed that he can recall advertisements. 66 respondents are neutral about their reaction on advertisements. 69 respondents are strongly agreed that they share their shopping experiences with their family members and 67 respondents are agreed that advertisement effect purchase of new brand. 54 respondents are disagreed that products are as good as expected from television advertisements. 40 respondents are neutral for attraction towards the costly branded products seen in advertisements. 47 respondents are disagreed that they intend to buy products after watching television advertisements. 62 respondents are agreed that advertisements increase the price of products. 49 respondents are agreed that they try to purchase the products at their own level after watching television advertisements. 53 respondents are strongly disagreed that they try to copy the television advertisements. 45 respondents are disagreed that they insist their parents to buy the same product as seen in the television advertisement. 52 respondents are strongly disagreed that they get unhappy when they are unable to get the product which they see in television advertisements. 43 respondents are disagreed that they tried various haircuts, dresses and styles as seen in television advertisements and 63 respondents are agreed television advertisements make them aware about the new products. 62 respondents are agreed television advertisements inspire them to stay clean and build good habits and 47 respondents are strongly disagreed and disagreed that television advertisements tell truth. 55 respondents are agreed television advertisements increase their knowledge and 74 respondents are agreed advertisement change the customer's attitude about various products. 52 respondents are agreed advertisement hide the facts and 41 respondents are disagreed advertisements force to buy the products. 47 respondents are disagreed that they have tried to change their life style according to advertisements shown in television. 64 respondents are agreed that television effect a person's brain development and 55 respondents are agreed that television influences their attitude towards themselves and 48 respondents are agreed that television advertisements affect health. 41 respondents are agreed watching television causes overweight. 56 respondents are agreed that television habits are risk factor for many adult health problems and 43 respondents are agreed that watching television advertisements cause sleeping problems. 63 respondents are agreed television advertisements make them aware. 59 respondents are agreed television advertisements impart information and educative. 50 respondents are agreed television has great importance in their life. 46 respondents are agreed that television advertisements create an urge in them to try the brand. 58 respondents are agreed television advertisements effect our culture. 53 respondents are agreed their parents consult with them before making a purchase decision and 53 respondents are agreed watching television effects their performance in school. 46 respondents are disagreed television advertisements have long lasting impact on them. 50 respondents are strongly agreed product with a good advertisement but poor quality ever disappoints them and 72 respondents are agreed that they refer to their friends and family before trying a new brand. 61 respondents are agreed that they find television advertisements attractive and 46 respondents are neutral about that it is easy for television commercials to convince them to buy certain products.

To test the appropriateness of factor analysis technique the correlation between the variables is checked and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy statistic is also used for the same. The correlation matrix is a lower triangle matrix showing the simple correlation,  $r$  between all possible pairs of variables included in the analysis. Being an identity matrix of population correlation matrix, all the diagonal terms are 1 and all off-diagonal terms are 0. The test statistics for sphericity is based on a Chi-square transformation of the determinants of the correlation matrix. KMO compares the magnitude of the observed correlation coefficients to the magnitude of partial correlation coefficients. Small the value of KMO statistic indicate that the correlation between pairs of variables cannot be explained by other variables and the factor analysis may not be appropriate. Generally, a value greater than 0.5 is desirable for the test statistic. Here, it can be seen from Table 3 that the null hypothesis, that the population correlation matrix is an identity matrix, is rejected by Bartlett's test of sphericity. The approximate Chi-square statistic value is 1893.850 with 780 degree of freedom, which is significant at 0.05 level. The value of KMO statistic 0.701 is also more than 0.5. Thus, factor analysis may be considered as appropriate technique for analyzing the correlation matrix. The matrix constructed from the data obtained in form of the responses of teenagers which shows their opinion about the impact of Television advertisements on their buying behavior.

Once it has been determined that factor analysis is suitable for analyzing the data, an appropriate method must be selected. The approach used to drive the weight or factor score coefficients. The two basic approaches are principal component analysis (PCA) and Common factor analysis (CFA). In PCA, the total variance in data is considered. The diagonal of the correlation matrix consists of unities and full variance is brought into the factor analysis. PCA is recommended when the primary concern is to determine the minimum number of factors that will account for maximum variance in the data for use in subsequent multivariate analysis. Further, PCA may be carried out if the correlation for the variables contains at least two correlations of 0.30 or greater. The correlation matrix of 40 statements which were developed to know the overall opinion of teenagers towards the impact of Television advertisements on their buying behavior and it is found there are high correlations between the variables; therefore, it may be stated that factor analysis is appropriate.

The extraction communalities for each variable which is the amount of variance a variable shares with all the other variables being considered. It is also the proportion of variance explained by the common factors.

Table 4 shows that 13 factors have been extracted on the basis of prior knowledge to describe the relationships among variable in a best way. Finally, from the cumulative percentage of variance accounted for, it can be seen that 13 account for 64.932 per cent of the variance, contributed by first component is 16.801 followed by second (6.517 per cent), third (5.961 per cent), fourth (5.056 per cent) and fifth (4.521 per cent) of total variance.

The rotation was made by the most commonly used method *i.e.* varimax procedure. This is an orthogonal method of rotation that minimizes the number of variables with high loadings on a factor, thereby enhancing the interpretability of the factors. Interpretation is facilitated by identifying the variables that have large loadings on the same factor. For the purpose of interpretation, each factor was composed of variables that loaded 0.30 or higher on that factor. In case, where variables loaded 0.30 or above on two factors. In case, where variables loaded 0.30 or above on two factors, each variable was assigned to the factor where it had the highest loading. The maximum of each row (ignoring the sign) indicates the respective variable belongs to the respective component (Table 5).

After interpretation of the factors, Table 6 enlists the rating of factors on the basis of their importance and also depicts the results through ANOVA. It depicts that factor 8 is at the top by which teenagers' perceived changing attitude for television advertisements and factor 12 is at bottom where teenagers are not agreed that the products are as good as expected from Television advertisements.

As far as F-statistics (ANOVA) is concerned, Table 6 shows that teenagers significantly differ age-wise in their opinions towards various statements like they insist their parents to buy the same product for them as seen in the television advertisement, they watch television advertisements in the same proportion, advertisements forces the viewers to buy the products shown in television, television advertisements create an urge in them to try the brand, watching television for long time causes overweight to them, they share their shopping experiences with their family members, they react on television advertisements in same proportion and they get attracted towards the costly branded products shown in advertisements. Gender-wise they significantly differ in their opinions towards the various statements such as television advertisements create an urge in them to try the brand, watching television affect their brain development, television advertisements make them aware about new products, television advertisements affect their health, they get more attracted towards the costly branded products shown in advertisements and advertisements hide facts from them at 0.05 significance level by rejecting null hypothesis.

**CONCLUSION**

Majority of the teenagers are male in the age group from 15 to 18 years affected from the television advertisements. It is found that teenagers differs their opinions towards parents to buy those products as they watched in television advertisements. Television advertisements forced the viewers to buy the products and urge them to try the brand. Further, it is also found that the habit of watching television for long time causes overweight among the teenagers. Moreover, they are attracted by costly branded products shown in advertisements in the media. They also share their shopping experiences with their family members. Therefore, it may be recommended that the producers or marketers should frame ethical advertising strategies keeping in mind the health and social impact among the teenagers.

**REFERENCES**

1. Asadollahi, A., & Tanha, N. (2011). The Role of Television Advertising and its Effects on Children. *Interdisciplinary Journal of Research in Business*, 1(9), 01-06.

2. Ashaduzzaman, & Asif-Ur-Rehman, S. M. (2011). Impact of Television Advertisements on buying pattern of Women in Dhaka City. *European Journal of Business and Management*, 3(3), 16-28.
3. Dave, Harsh Wardhan (2013). Digital Advertising in India. Retrieved August 24, 2013. from [www.slideshare.net/.../digital-advertising-in-india-statistics-trends-2013](http://www.slideshare.net/.../digital-advertising-in-india-statistics-trends-2013).
4. Gayatri, & Gaur, S. (2012). Impact of Television Advertisement on Teenagers in Delhi and NCR. *International Journal of Management*, 2(1).
5. Haroon, M., Qureshi, T. M., Zia-ur-Rehman, M., & Nisar, M. (2011). Does the Food Advertisement on Television Have the Impact on Children's Food Purchasing Behavior? A Study Based on Pakistan Food Advertisement. *International Journal of Business and Management*, 6(1), 283-288.
6. <http://articles.mercola.com/sites/articles/archive/statin-tv-ads.aspx> on 21/08/2013
7. Kamat, Payal (2012). Impact of Advertisement. Retrieved August 24, 2013. from [www.preservearticles.com/.../short-essay-on-the-impact-of-advertisement](http://www.preservearticles.com/.../short-essay-on-the-impact-of-advertisement).
8. Pankaj Priya, Rajat Kanti Baisya and Seema Sharma, (2010). Television advertisements and children's buying behaviour. *Marketing Intelligence & Planning*, 28(2), 151 – 169.
9. Pongiannan, K. (2011). Viewers' Perception towards Advertisements on Television Media As A Promotional Strategy in the Current Marketing Scenario. *Indian Journal of Marketing*, 39-45.
10. Retrieved August Thursday, 2013 from [www.kantarmediana.com](http://www.kantarmediana.com) › Business Units › Intelligence › Press.
11. Singh, J., & Sandhu, N. (2011). Impact of Television Commercials on the Social and Moral Behaviour of Indian Viewers-Empirical Evidence. *International Journal of Humanities and Social Sciences*, 1(7).
12. Singh, M., & Kaur, K. (2011). Risks Associated with Celebrity Endorsements - An Empirical Analysis From Punjab. *Indian Journal of Marketing*, 10-18.
13. Singh, S., & Kaur, J. P. (2011). The Impact of Advertisements on Children and Their Parents' Buying Behavior: An Analytical Study. *The IUP Journal of Marketing Management*, X(3), 18-41.

**TABLES**

**TABLE 1: PROFILE OF RESPONDENTS**

Age	Gender		Per cent
	Male	Female	
12-15	22	22	29.3
15-18	61	45	70.7
<b>Total</b>	<b>83</b>	<b>67</b>	<b>100</b>

Source: Survey (Data processed through PASW 18.0)

**TABLE 2: BUYING BEHAVIOUR OF TEENAGERS REGARDING TELEVISION ADVERTISEMENTS**

Statements	Response					Mean	S.D.
	SA	A	N	D	SD		
1. I watch television advertisements	66	69	14	1	0	1.67	0.672
2. I can recall advertisements	28	69	30	14	9	2.38	1.079
3. I react on television advertisements	15	45	66	23	1	2.67	0.880
4. I share my shopping experiences with my family	69	52	17	6	6	1.85	1.039
5. Advertisement effect purchase of new brand	48	67	18	15	2	2.04	0.982
6. Products are as good as expected from television advertisements	9	5	52	54	30	3.61	1.036
7. I get more attracted towards the costly branded products seen in advertisements	28	32	46	26	18	2.83	1.263
8. I intend to buy products after watching television advertisements	10	34	37	47	22	3.25	1.158
9. Advertisements increase the price of products	56	62	18	10	4	1.96	1.003
10. I try to purchase the products at my own level after watching television advertisements	20	49	25	32	24	2.94	1.312
11. I try to copy the television advertisements	9	15	24	49	53	3.81	1.195
12. I insist my parents to buy the same product as seen in the television advertisement	8	21	32	45	44	3.64	1.194
13. I get unhappy/ depressed when I am not able to get the product which I saw in television advertisements	7	25	26	40	52	3.70	1.236
14. I tried various haircuts, dresses and styles as seen in Television advertisement	20	32	32	43	23	3.11	1.282
15. Television advertisements make me aware about the new products	61	63	16	6	4	1.86	0.949
16. Television advertisements inspire me to stay clean and build good habits	40	62	30	8	10	2.24	1.109
17. Television advertisements tell the truth	3	10	43	47	47	3.83	1.013
18. Television advertisements increase my knowledge	32	55	44	17	2	2.35	0.983
19. I think that advertisements change the customer's attitude about various products	32	74	29	10	5	2.21	0.966
20. Advertisements hide the facts	34	52	36	17	11	2.46	1.174
21. Advertisements force to buy the products	20	21	33	41	35	3.33	1.334
22. I have tried to change my life style according to advertisements shown in television	8	30	38	47	27	3.37	1.149
23. Television effect a person's brain development	28	64	30	21	7	2.43	1.089
24. Television influences my attitude towards myself and others	4	55	41	34	16	3.02	1.065
25. Television advertisements affect health	25	48	28	30	19	2.80	1.290
26. I think that watching television causes overweight	30	38	41	24	17	2.73	1.267
27. Television habits are a risk factor for many adult health problems	32	56	37	18	7	2.41	1.094
28. Watching television advertisements cause sleeping problems	34	43	34	27	12	2.60	1.242
29. I think that television advertisements make me aware	34	63	35	10	8	2.30	1.060
30. Television advertisements impart information and educative	19	59	48	15	9	2.57	1.032
31. Television has great importance in my life	21	50	46	18	15	2.71	1.156
32. Television advertisements create an urge in me to try the brand	23	37	46	28	16	2.85	1.208
33. Television advertisements effect our culture	29	58	35	17	11	2.49	1.145
34. My parents consult with me before making a purchase decision	25	53	52	12	8	2.50	1.035
35. Watching television effects my performance in school	28	53	33	27	9	2.57	1.161
36. The advertisements have long lasting impact on me	5	38	45	46	16	3.20	1.043
37. Product with a good advertisement but poor quality ever disappoints me	50	47	32	13	8	2.21	1.156
38. I refer to my friends and family before trying a new brand	35	72	24	9	10	2.25	1.086
39. I find television advertisements attractive	26	61	36	11	16	2.53	1.180
40. It is easy for the television commercials to convince me to buy certain products	7	30	46	31	36	3.39	1.187

Source: Survey, (SA= Strongly Agree, A= Agree, N= Neutral, D= Disagree, SD= Strongly Disagree)

TABLE 3: KMO AND BARTLETT'S TEST

Kaiser- Meyer-Olkin Measure Adequacy		.701
Bartlett's Test of Sphericity	Approx. Chi-Square	1893.850
	df	780
	Sig.	.000

Source: Primary

TABLE 4: TOTAL VARIANCE EXPLAINED

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.720	16.801	16.801	6.720	16.801	16.801	3.006	7.515	7.515
2	2.607	6.517	23.318	2.607	6.517	23.318	2.600	6.499	14.014
3	2.384	5.961	29.279	2.384	5.961	29.279	2.502	6.254	20.269
4	2.022	5.056	34.336	2.022	5.056	34.336	2.386	5.965	26.234
5	1.805	4.512	38.848	1.805	4.512	38.848	2.343	5.857	32.091
6	1.593	3.983	42.831	1.593	3.983	42.831	1.907	4.768	36.859
7	1.557	3.894	46.725	1.557	3.894	46.725	1.846	4.615	41.474
8	1.396	3.490	50.215	1.396	3.490	50.215	1.736	4.339	45.813
9	1.297	3.243	53.458	1.297	3.243	53.458	1.662	4.154	49.968
10	1.249	3.123	56.581	1.249	3.123	56.581	1.633	4.083	54.051
11	1.225	3.063	59.644	1.225	3.063	59.644	1.567	3.917	57.968
12	1.084	2.710	62.353	1.084	2.710	62.353	1.412	3.530	61.498
13	1.031	2.578	64.932	1.031	2.578	64.932	1.373	3.434	64.932

Extraction Method: Principal Component Analysis.

Source: Primary

TABLE 5: IMPACT OF TELEVISION ADVERTISEMENTS ON BUYING BEHAVIOR AMONG TEENAGERS

Factor	Factor interpretation	Loading	Variables included in the factor
F <sub>1</sub>	Purchase Intention	.539	8 I intend to buy products after watching TV advertisements.
		.706	11 I try to copy the TV advertisements
		.699	12 I insist my parents to buy the same product as seen in the TV advertisement
		.585	13 I get unhappy/ depressed when I am not able to get the product which I saw in TV advertisements.
		.470	17 TV advertisements tell the truth.
		.406	34 My parents consult with me before making a purchase decision.
F <sub>2</sub>	Television Advertisements	.443	40 It is easy for the TV commercials to convince me to buy certain products.
		.767	1 I watch TV advertisements.
		.770	2 I can recall advertisements.
		.518	21 Advertisements force to buy the products.
F <sub>3</sub>	Effect on Health	.433	32 TV advertisements create an urge in me to try the brand.
		.710	26 I think that watching TV causes overweight.
		.780	27 TV habits are a risk factor for many adult health problems.
F <sub>4</sub>	Social effects	.610	28 Watching TV ads cause sleeping problems.
		.492	33 TV advertisements effect our culture.
		.565	37 Product with a good advertisement but poor quality ever disappoints me.
		.359	38 I refer to my friends and family before trying a new brand.
F <sub>5</sub>	Increases knowledge	.688	39 I find TV advertisements attractive.
		.463	16 TV advertisements inspire me to stay clean and build good habits.
		.803	18 TV advertisements increase my knowledge.
		.419	29 I think that TV advertisements make me aware.
F <sub>6</sub>	Change in Life	.563	30 TV advertisements impart information and are educative.
		.775	22 I have tried to change my life style according to advertisements shown in TV.
		.493	23 TV effect a person's brain development.
F <sub>7</sub>	Increases Awareness	-.663	9 Advertisements increase the price of products.
		.455	10 I try to purchase the products at my own level after watching TV advertisements.
		-.577	15 TV advertisements make me aware about the new products.
		-.364	25 TV ads effect health.
F <sub>8</sub>	Changing Attitude	-.821	4 I share my shopping experiences with my family.
		.487	19 I think that advertisements change the customer's attitude about various products.
F <sub>9</sub>	Attitude towards the advertisements	.660	3 I react on TV advertisements.
		.495	24 TV influences my attitude towards myself and others.
		.387	36 The advertisements have long lasting impact on me.
F <sub>10</sub>	Switching to New Brand	.795	5 Advertisement effect purchase of new brand.
		.506	7 I get more attracted towards the costly branded products seen in advertisements.
F <sub>11</sub>	Importance of TV	-.467	14 I tried various haircuts, dresses and styles as seen in TV advertisement.
		.333	31 TV has great importance in my life.
		.816	35 Watching television effects my performance in school.
F <sub>12</sub>	Product's Similarity with TV ads	.777	6 Products are as good as expected from TV ads.
F <sub>13</sub>	Hide the facts	.868	20 Advertisements hide the facts.

Source: Primary

TABLE 6: OVERALL OPINION ABOUT THE IMPACT OF TELEVISION ADVERTISEMENTS ON BUYING BEHAVIOR AMONG TEENAGERS

Factor	Sr. No.	Variables included in the factor	Mean of Variable	Mean of Factor (Rank)	Inferential Statistics			
					Age (df=1)		Gender (df=1)	
					F	Sig.	F	Sig.
Purchase Intention (F <sub>1</sub> )	8	I intend to buy products after watching TV advertisements.	3.25	3.4457 (12)	2.003	.082	2.677	.104
	11	I try to copy the TV advertisements.	3.81		1.354	.245	.568	.452
	12	I insist my parents to buy the same product as seen in the TV advertisement.	3.64		2.701	.023*	.494	.483
	13	I get unhappy/ depressed when I am not able to get the product which I saw in TV advertisements.	3.70		1.232	.297	2.194	.141
	17	TV advertisements tell the truth.	3.83		1.432	.216	.894	.346
	34	My parents consult with me before making a purchase decision.	2.50		.661	.653	.509	.477
TV Advertisements (F <sub>2</sub> )	40	It is easy for the TV commercials to convince me to buy certain products.	3.39	2.5575 (7)	1.011	.414	.214	.644
	1	I watch TV advertisements.	1.67		2.377	.042*	.423	.517
	2	I can recall advertisements.	2.38		.653	.659	.289	.592
	21	Advertisements force to buy the products.	3.33		2.469	.035*	2.077	.152
Effect on Health (F <sub>3</sub> )	32	TV advertisements create an urge in me to try the brand.	2.85	2.5800 (8)	1.526	.185	5.026	.026*
	26	I think that watching TV causes overweight.	2.73		2.414	.039*	.396	.530
	27	TV habits are a risk factor for many adult health problems.	2.41		.796	.554	.163	.687
Social effects (F <sub>4</sub> )	28	Watching TV ads cause sleeping problems.	2.60	2.3700 (3)	2.104	.068	.056	.813
	33	TV advertisements effect our culture.	2.49		1.857	.106	.053	.819
	37	Product with a good advertisement but poor quality ever disappoints me.	2.21		.674	.644	.105	.746
	38	I refer to my friends and family before trying a new brand.	2.25		.936	.459	3.079	.081
Increases knowledge (F <sub>5</sub> )	39	I find TV advertisements attractive.	2.53	2.3650 (2)	.912	.475	.636	.927
	16	TV advertisements inspire me to stay clean and build good habits.	2.24		1.290	.271	2.722	.101
	18	TV advertisements increase my knowledge.	2.35		1.330	.255	.396	.530
	29	I think that TV advertisements make me aware.	2.30		1.311	.263	1.580	.211
Change in Life (F <sub>6</sub> )	30	TV advertisements impart information and are educative.	2.57	2.9000 (10)	2.083	.071	.324	.570
	22	I have tried to change my life style according to advertisements shown in TV.	3.37		1.424	.219	.007	.936
Increases Awareness (F <sub>7</sub> )	23	TV effect a person's brain development.	2.43	2.3900 (4)	.880	.496	5.236	.024*
	9	Advertisements increase the price of products.	1.96		.261	.933	.192	.662
	10	I try to purchase the products at my own level after watching TV advertisements.	2.94		2.361	.043*	.771	.381
	15	TV advertisements make me aware about the new products.	1.86		.721	.609	8.446	.004*
Changing Attitude (F <sub>8</sub> )	25	TV ads effect health.	2.80	2.0300 (1)	.846	.519	4.573	.034
	4	I share my shopping experiences with my family.	1.85		2.583	.029*	.117	.732
Attitude towards the advertisements (F <sub>9</sub> )	19	I think that advertisements change the customer's attitude about various products.	2.21	2.9633 (11)	1.875	.102	.048	.827
	3	I react on TV advertisements.	2.67		2.499	.033*	.247	.620
	24	TV influences my attitude towards myself and others.	3.02		1.246	.291	2.735	.100
Switching to New Brand (F <sub>10</sub> )	36	The advertisements have long lasting impact on me.	3.20	2.4350 (5)	1.362	.242	1.845	.176
	5	Advertisement effect purchase of new brand.	2.04		.534	.750	.150	.699
Importance of TV (F <sub>11</sub> )	7	I get more attracted towards the costly branded products seen in advertisements.	2.83	2.7967 (9)	2.788	.020	8.033	.005*
	14	I tried various haircuts, dresses and styles as seen in TV advertisement.	3.11		.579	.716	.317	.574
	31	TV has great importance in my life.	2.71		.850	.516	.644	.424
Product's Similarity with TV ads (F <sub>12</sub> )	35	Watching television effects my performance in school.	2.57	3.61 (13)	1.413	.223	1.784	.184
Hide the facts (F <sub>13</sub> )	6	Products are as good as expected from TV ads.	3.61		.861	.509	.068	.795
	20	Advertisements hide the facts.	2.46	2.46 (6)	.880	.496	5.715	.018*

Source: Primary

\* Significant value at 5 % level of Significance

## AN EFFICIENT SMART SURVEILLANCE APPLICATION ON ANDROID DEVICE USING MESSAGING SERVICE AND EFFICIENT MOTION DETECTION MECHANISM

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### ABSTRACT

Nowadays, surveillance applications has gained its importance globally in both public and private areas. These applications are developed with the motion detection task that will determine the motion detection region. The methods that exists for motion detection sometimes may not be applicable for areas where there are issues like changes in illumination, noise disturbances etc. The proposed system is facilitated to compensate the limitations with the high quality model as the background and it is applied to extract the moving objects that are captured in a video sequence. The proposed application is concentrated on the unmanned areas of surveillance especially during at night. Here, the video that are captured are stored on the server. If an unusual image is detected it notifies the incident to the user on his android device and the corresponding video, image can also be viewed on the android device. Thus, this application increases the flexibility, mobility and reduces the workload of continuous monitoring.

### KEYWORDS

Android device, background model, motion detection, Surveillance application, unmanned areas.

### 1. INTRODUCTION

Many video surveillance applications that are also intelligent devices has become a part of day-to-day life to facilitate high security. In unmanned surveillance areas, detecting the motion and details about the detected motion is a challenging task [1]. Tracking and detecting the objects in video forms the basis for many surveillance applications ranging from video production to remote surveillance and from robotics to interactive games. Video forms the high end source of visual information than still image [2]. The proposed application can be deployed at various places such as ATMs, away from home spots, temples and museums to preserve valuable antiques.

### 2. PRELIMINARIES

The preliminaries used in this section are the prerequisite terms needed for the proposed application. The terms are cited as follows.

#### A. MOTION DETECTION AND ITS TASK IN VIDEO TRACKING

Video cameras assist in motion detection by capturing the objects of interest in the form of sets of image pixels where qualitative measurements such as recall and precision are used for assessment [14]. The video tracker estimates the location of the object over a time by modelling the relationship between the appearance of the target and its corresponding pixel values. Determination of the relationship between an object and its image projection is very complex that makes the video tracking task difficult.

Motion detection refers to the capability of the system to detect the motion and capturing the events. Motion detection is also called as activity detection, which is a software-based monitoring algorithm [14]. It implies that when the system detects any motions the event is captured. The major application areas of motion detection methods includes visualization of traffic flow, to classify the highway lanes, driving assistance, face detection, interaction of human-machine and remote image processing.

#### B. MECHANISM OF EARLIER VIDEO SURVEILLANCE

Video surveillance is basically monitoring of an area with some form of video recording device, which would be primarily in location where security is of high importance. In the current scenario for surveillance applications, varieties of surveillance cameras have emerged. To list a few are infrared Day/night camera, dome security camera, bullet security camera, box security camera, Pan Tilt Zoom (PTZ) security camera and hidden camera.

In earlier scenarios of surveillance, Closed Circuit Television (CCTV) started video monitoring as a simple method of black and white video sequence from remote cameras to a central monitoring location [4]. The central monitoring location was manned, and recording of videos were analog. Historically, the quality of the recorded video was low in resolution, reflecting unrecognized objects that were transported over coaxial cables that were limited in bandwidth. The recorded video was stored as analog signal on magnetic tapes. Magnetic tapes have many operational problems like constant tape change, cumbersome information retrieval and very limited remote access. Traditional video surveillance had several technological limitations that have to be foreseen, and required adapting to new technologies in order to match the growing demands for video control by collecting and processing the monitored information.

Recent surveillance systems have efficiently replaced traditional surveillance systems. Digital technology emerged to facilitate the ultimate needs of surveillance [9]. To compensate the operational and technological limitations of earlier surveillance systems, Internet Protocol (IP) technology over Ethernet is combined with digital video [5]. IP/Digital surveillance uses IP camera that can send and receive data via a computer network and the internet. The IP camera can be centralized or decentralized. IP/Digital surveillance provides constant real-time operational information such as high-quality digital images which enables flexible, real-time, highly manageable and tunable solution. Besides the technical advancements it is affordable and cost-effective for customized deployment in large areas of surveillance. Thus, the overall motive of IP/Digital surveillance is to efficiently and effectively maintain security and intrusion detection at the monitored location.

#### C. RECENT TREND IN SURVEILLANCE USING SMART PHONE

Smart phone is a device that is built on mobile operating system that has the capability of more advanced computing and connectivity than a feature phone [3]. The rapid development of mobile applications and m-commerce has been the drivers of smartphone adoption that combines the Personal Digital Assistant (PDA) with the mobile phone. It also includes high resolution touch screen and web browser that displays the standard web page as well as mobile optimized sites. Wi-Fi and mobile broadband facilitates the high speed access to the internet on smartphones.

Some of the smartphone operating system includes android (Google), iOS (Apple), Symbian (Nokia), web OS (Hewlett – Packard); windows phone (Microsoft) etc. These technical advancements have assisted in monitoring the areas over a smart phone. Thus smart phone surveillance has improved the dynamism in monitoring, more flexible for remote access of surveillance areas.

### 3. RELATED WORK

The related work in this section describes the various methods of detecting motion and their discussion with respect to their pros and cons.

According to earlier research work, motion detection methods are classified into three major categories temporal difference, optical flow and back ground subtraction. In temporal difference methods the shapes of the moving object are incomplete because it readily accustom to sudden changes in the environment [8]. In optical flow methods the certain characteristics of flow vectors depict the projected motion on the image plane with appropriate approximation [10]. The computational complexity is too high to implement the motion task in video surveillance system because, streams of moving objects are indicated by flow

vectors and detected object region is sparse [11]. Background subtraction detects the moving objects by estimating the exact difference the current and previous frame. The previous frame is also called as reference frame or background image or background model [6] [7].

The basic criterion is that background image is a representation of the scene with static or constant objects that are updated regularly to avoid the frequent changes in luminance and coordinate settings [6]. Background subtraction method has proved to be the best out of the above mentioned categories due to the time complexity and the accurate detection of moving objects. The background model that is generated has specified limitations with respect to the region. The efficient background model must adapt to gradual increase of illumination changes, dynamic background movements, should exhibit noise tolerance, should not be responsive to repetitive motions from clutters, generated of proper video sequence at the beginning and implementation set up should be fast and reliable [12]. The each frame that is held can include moving objects. Using the single background model, several methods are used to generate more number of reference images that are applied for the calculation of mixture of background model, which also has a drawback of inaccuracy in detecting objects [13].

Numerous algorithms with background subtraction method have been facilitated to estimate the moving object. These algorithms range from simple to more complex approaches, aim to improve the speed and limit the memory requirements. The various algorithms that facilitate background subtraction are as follows.

- Russian Gaussian Average method uses the independent pixel location of the background model.
- Temporal median filter method proposes that to use the median values of the last n frames as the background model.
- Mixture of Gaussian method is used when each pixel can be represented as a mixture with particular to one or more distribution.
- Kernel Density Estimation (KDE) is a non-parametric method to calculate the probability density function on the buffer of last n background values.
- Sequential Kernel Density Approximation initially detects the background probability density function from initial sample set that is frequently updated.
- Eigen background method is applied to the whole image instead of a block that facilitates the extensive spatial correlation and avoids tiling effect on block partitioning.

Amongst the methods specified, simple algorithms such as Russian Gaussian Average and temporal median filter of an accuracy and frame rate is high with limited memory requirements. Kernel Density Estimation has higher requirements for memory that prevents easy implementation on low memory devices. Sequential Kernel Density approximation is an approximation of KDE that proved to be almost accurate but mitigate the memory requirements and time complexity is reduced [1].

**4. PROPOSED SYSTEM**

The proposed work describes the smart surveillance system for unmanned indoor environment by accurately detecting the motion and delivering the push notification to view the unusual image that is been detected in the areas of surveillance.

**A. ESTIMATION OF THE FRAME DIFFERENCE**

Frame is digitally coded image in a video technology. It is a matrix representation that comprises picture elements. Each picture consists of a horizontal set of elements that is referred to as line. Frame rate is the number of frames that are scanned per second in a moving picture.

The picture facilitates the determination of the background region. Here, the background model that is generated is subtracted with the each input frame to obtain the frame reference values. For better sense of motion, higher frame rate is used. The most commonly used frame rates are 59.94 fps, 50 fps, 29.97 fps, 25 fps and 23.976 fps. Historically, the frame rate was 24 fps. This frame rate is the minimum acceptable rate due to the high cost. The reference frame always contains the background region and the motion detection methods can easily generate the background model but with noise as a limitation.

Temporal resolution describes the ability of the frame rate to capture moving objects. For higher frame rate is said to have better temporal resolution than a lower one. Refresh rate is the difference in rates at which the video frames are captured and displayed. Refresh rate is generally expressed in cycles/sec called Hertz. In today’s market, the accepted maximum display rate is of 60 fps.

The exact differencing image  $\Delta_i(x,y)$  is generated by calculating the modulus of the difference between background model  $B_i(x,y)$  and the incoming video frame  $I_i(x,y)$  at each frame.

$$\Delta_i(x, y) = | B_i(x, y) - I_i(x, y) | \tag{1}$$

**B. PIXEL CALCULATION BY RGB PROCESSING AND REPROCESSING**

The accurate detection of the pixels at each frame is calculated by the Cauchy distribution model which uses the absolute frame differential estimation [15].

**FIGURE 1: FLOW OF PIXEL CALCULATION**

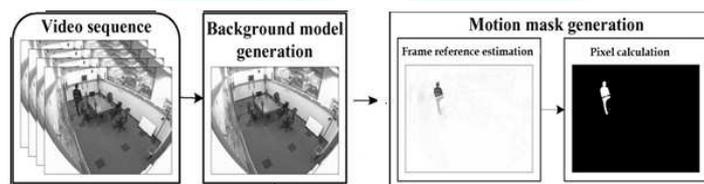


Fig. 1 depicts the flow of pixel calculation from video sequence where the background model that is generated is used for accurate motion detection. The model (f) is calculated as follows:

$$f(\Delta(x, y); a_2, b) = \frac{1}{\Pi} \left[ \frac{b}{(\Delta(x, y) - a_2)^2 + b^2} \right] \tag{2}$$

Finally,  $D_i(x,y)$  is formulated as follows:

$$D_i(x, y) = \begin{cases} 0, & \text{if } f_1 > f_2 \\ 1, & \text{otherwise} \end{cases} \tag{3}$$

If  $D_i(x,y)$  is equal to 0, then it belongs to the background region of  $I_i(x,y)$  otherwise, it belongs to moving objects in  $I_i(x,y)$ .

**C. OVERVIEW OF GCM**

Google Cloud Messaging (GCM) is a free messaging service for android. It helps the developers to send data from servers to their applications on android supported devices. It also upstream messages from the user’s device back to the cloud. This message is a lightweight message that indicates about the new data to be fetched from server to the android application.

The implementation of GCM is that GCM connection servers and 3<sup>rd</sup> party app server establishes communication with the android device through the unique registration ID that is been generated.

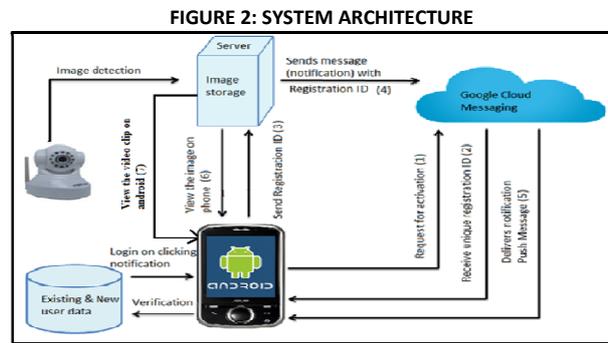
The primary characteristics of the messaging services are

- It allows 3<sup>rd</sup> party application servers to send notification messages to the android application.
- The upstream messages from the user’s device are received.

- To receive messages it is not necessary for the application to run.
- There are no built-in interfaces or other handling for message

## 5. SYSTEM MODEL

The implementation of the proposed work requires smartphone with the minimum required version of Android 3.0 and Internet Protocol camera. The software requirements are as follows. Eclipse is an Integrated Development Environment that supports multi-language. It consists of a base workspace and an extensible plug-ins for customizing the environment. Android Development Tool (ADT) is a plugin for eclipse IDE that facilitates the development of android applications.



The flow of the system model (fig. 2) is described as follows:

1. The surveillance camera is connected to the server and the area is continuously monitored. The monitored area is unmanned, i.e. it does not require any human intervention.
2. The current frame and the previous frames are compared. If there is any difference in the frame comparison, then it indicates that a motion is detected in the monitored area (i.e. the background model).
3. The difference in image that is been detected are captured and stored in the server and sent as an alert or notification message to the authenticated user.
4. Meanwhile, the video clip is also stored in the server. The application monitors the area and if any there is any detection of the motion, the recording starts from that point and it is stored in the server.
5. The authenticated user can view the notification and with the help of the notification message the user can the view the detected image with the Uniform Resource Locator (URL) from where the message was sent.
6. If the user wants to view the video source , he can view it using the Uniform Resource Locator, where the video and image is stored.

## 6. CONCLUSION

In today's market, various low cost IP cameras and smartphones are available. Surveillance system through smart phones ensures the flexibility, and enhances the mobility of the user that reduces the workload of continuous manned monitoring. The added advantage of the system is that the messaging service incorporated here allows the notifications to be sent to one or more authenticated users and also allows the users to view the video of the corresponding image. Thus the main motivation is to develop a society oriented application to control and prevent any suspicious activities in the public and private locations.

## REFERENCES

1. JiuYue Hao ; Chao Li ; Zuwhan Kim ; Zhang Xiong "Spatio-Temporal Traffic Scene Modeling for Object Motion Detection" Intelligent Transportation Systems, IEEE Transactions on Volume: 14 , Issue: 1 Digital Object Identifier: 10.1109/TITS.2012.2212432 Publication Year: 2013 , Page(s): 295 – 302.
2. Shahrah, A.Y. ; Hossain, M.A. ; Alghamdi, A.S., "A collaboration architecture for distributed smart surveillance systems based on DoDAF 2.0" Computer Science and Software Engineering (JCSSE), 2012 International Joint Conference on Digital Object Identifier: 10.1109/JCSSE.2012.6261970 Publication Year: 2012 , Page(s): 305 – 310.
3. Rashmi, R. ; Latha, B., "Video surveillance system and facility to access Pc from remote areas using smart phone" Information Communication and Embedded Systems (ICICES), 2013 International Conference on Digital Object Identifier: 10.1109/ICICES.2013. 6508393 Publication Year: 2013 , Page(s): 491 – 495.
4. Rankin, S. ; Cohen, N. ; MacLennan-Brown, K. ; Sage, K. , " CCTV Operator Performance Benchmarking" Security Technology (ICCST), 2012 IEEE International Carnahan Conference on Digital Object Identifier: 10.1109/CCST.2012.6393580 Publication Year: 2012 , Page(s): 325 – 330.
5. Yi Gu ; Myoungjin Kim ; Yun Cui ; Hanku Lee ; Okkyung Choi ; Mowook Pyeon ; Jeeln Kim, " Design and Implementation of UPnP-Based Surveillance Camera System for Home Security" Information Science and Applications (ICISA), 2013 International Conference on Digital Object Identifier: 10.1109/ICISA.2013.6579349 Publication Year: 2013 , Page(s): 1 – 4.
6. Hati, K.K. ; Sa, P.K. ; Majhi, B., " Intensity Range Based Background Subtraction for Effective Object Detection" Signal Processing Letters, IEEE Volume: 20 , Issue: 8 Digital Object Identifier: 10.1109/LSP.2013.2263800 Publication Year: 2013 , Page(s): 759 – 762.
7. J.-E. Ha and W.-H. Lee, "Foreground objects detection using multiple difference images," Opt. Eng., vol. 49, no. 4, p. 047 201, Apr. 2010.
8. C.-C. Chang, T.-L. Chia, and C.-K. Yang, "Modified temporal difference method for change detection," Opt. Eng., vol. 44, no. 2, pp. 1–10, Feb. 2005.
9. D.-M. Tsai and S.-C. Lai, "Independent component analysis-based background subtraction for indoor surveillance," IEEE Trans. Image Process., vol. 18, no. 1, pp. 158–167, Jan. 2009.
10. F. Barranco, J. Diaz, E. Ros, and B. Pino, "Visual system based on artificial retina for motion detection," IEEE Trans. Syst., Man, Cybern.B, Cybern., vol. 39, no. 3, pp. 752–762, Jun. 2009.
11. Doshi and A. G. Bors, "Smoothing of optical flow using robustified diffusion kernels," Image Vis. Comput., vol. 28, no. 12, pp. 1575–1589, Dec. 2010.
12. D.-M. Tsai and S.-C. Lai, "Independent component analysis-based background subtraction for indoor surveillance," IEEE Trans. Image Process., vol. 18, no. 1, pp. 158–167, Jan. 2009.
13. C. Stauffer and W. E. L. Grimson, "Adaptive background mixture models for real-time tracking," in Proc. IEEE Comput. Vis. Pattern Recog., 1999, pp. 246–252.
14. Manzanera and J. C. Richefeu, "A new motion detection algorithm based on  $\Sigma$ - $\Delta$  background estimation," Pattern Recognit. Lett., vol. 28, no. 3, pp. 320–328, Feb. 2007.

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