AN ANALYSIS OF EMERGING TRENDS IN BIG DATA AND DISCRETIONARY OPPORTUNITIES FOR INDIAN BPO INDUSTRY

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ABSTRACT

This paper attempts to identify and comprehensively address the various Big data trends happening across the cyberspace and how adaptive organizations are putting their efforts to usher in a completely new era of computing by being much closer to their customers and business associates.

Further the article stresses that mere creating excitement of Big Data alone is fairly insufficient whereas organizations has to lead through this change, by selectively destroying low impact systems, and aggressively changing their IT cost and investment structures as well to enable them to be much more agile and competitive in the new world of the nexus of forces which includes a confluence and integration of cloud, social collaboration, mobile and information would become the next age of computing.

Adding to the topic is how well Indian BPO space has been fit enough to capitalize and leverage this in the days to come by planning to update and replace the current IT architecture which will be rendered obsolete in the time of accelerating change. Subsequent to that how Indian IT leaders immediate focus on how their organization develops and attracts the skills required for those jobs which will be needed not only to grow your business but also the future of the new information economy.

KEYWORDS

BigData, BPO4.0, Data Analytics, Internet, Service Provider etc.

INTRODUCTION

Large volumes of data rule cyberspace today. There are Exabyte's of text, photos and videos by way of tweets, updates from networking sites, blogs, websites etc. Every organization is trying their best to decipher this huge amount of information.

As Alex 'Sandy' Pentland, Toshiba Professor of Media, Arts and Sciences, Massachusetts Institute of Technology observes, "We need to radically rethink our approach. Rather than separating systems by function water, food, waste, transport, education, energy, and so on we must consider them holistically. Instead of focusing only on access and distribution systems, we need dynamic, networked, self-regulating and resilient systems that take into account the complex socio-economic interdependencies of today's hyper connected world".

The bigger picture here as worldwide IT spending is close to $3.7 trillion in 2013, the global big data market was worth USD 6.3 billion in 2012 and is expected to reach USD 48.3 billion by 2018, at a CAGR of 40.5% from 2012 to 2018. North America is expected to maintain its lead position in terms of revenues until 2018, with about 54.5% share of the global big data market revenue, followed by Europe. The major four geographies covered are North America, Europe, Asia Pacific and RoW. North America is the largest market and held nearly 55% of the total big data market in 2012.

According to **Gartner, Inc.** "By 2015, 4.4 million IT jobs globally will be created to support Big Data alone, generating 1.9 million IT jobs in the United States," said Peter Sondergaard, senior vice president at Gartner and global head of Research. In addition, every big data-related role in the U.S. will create employment for three people outside of IT, so over the next four years a total of 6 million jobs in the U.S. will be generated by the information economy. Whereas India is Big Data opportunity is estimated at USD 200 million in 2012 and the Big Data outsourcing opportunity is projected to reach around USD 1.1-1.2 billion between 2012-15. The various end-use segments of big data are financial services, manufacturing, healthcare, telecommunication, government, retail, media and entertainment.

BIG DATA: A SNAPSHOT

IDC defines Big Data technologies *as a* **new** *generation of technologies and architectures, designed to* **economically** *extract* **value** *from very large* **volumes** *of a wide* **variety** *of data by enabling high-***velocity** *capture, discovery, and/or analysis.* There are three main characteristics of Big Data: the data itself, the analytics of the data, and the presentation of the results of the analytics. Then there are the products and services that can be wrapped around one or all of these Big Data elements.

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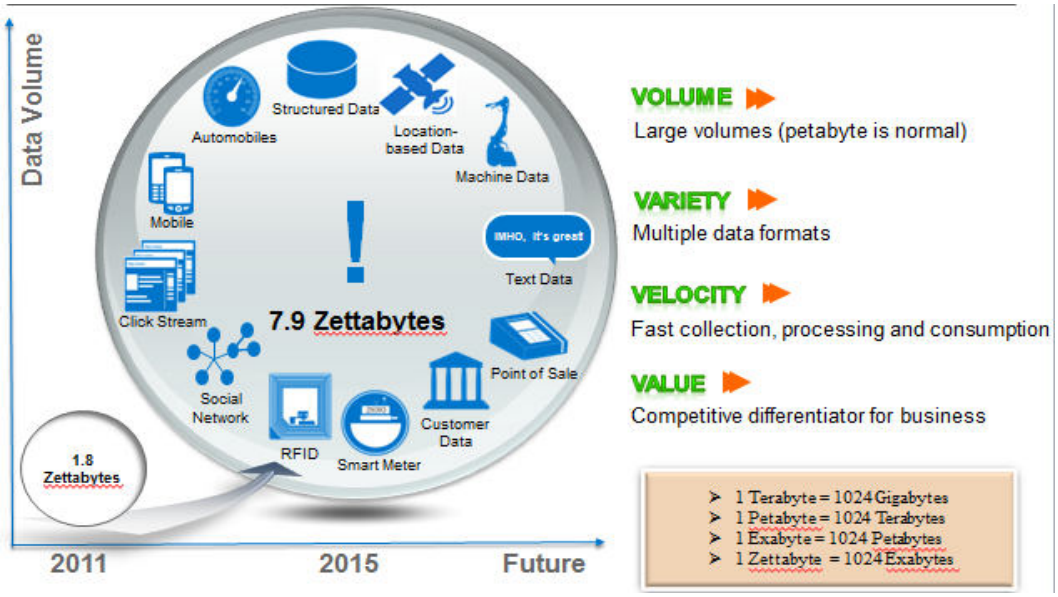
Figure-1



Sources: Adopted from Gartner Report2012

As per McKinsey Global Institute (MGI) study, Big data can generate value in five domains (i)healthcare in the United States(ii)the public sector in Europe(iii) retail in the United States(iv) manufacturing and(v) personal-location data globally. A retailer using big data could increase its operating margin by more than 60 percent. Harnessing big data in the public sector has enormous potential, too. If US healthcare were to use big data creatively and effectively to drive efficiency and quality, the sector could create more than $300 billion in value every year. Two-thirds of that would be in the form of reducing US healthcare expenditure by about 8 percent. In the developed economies of Europe, government administrators could save more than €100 billion ($149 billion) in operational efficiency improvements alone by using big data, not including using big data to reduce fraud and errors and boost the collection of tax revenues. In addition, users of services enabled by personal-location data could capture $600 billion in consumer surplus.

Using big data can create value in five broad ways:

- Big data can unlock significant value by making information transparent and usable at much higher frequency.
- As organizations create and store more transactional data in digital form, they can collect more accurate and detailed performance information on everything from product inventories to sick days, and therefore expose variability and boost performance
- Big data allows ever-narrower segmentation of customers and therefore much more precisely tailored products or services.
- Sophisticated analytics can substantially improve decision-making.
- Big data can be used to improve the development of the next generation of products and services.

Digitization has made significant strides in recent years - racks of documents and piles of files have been replaced with zettabytes (around 1 billion TB) of data digitally stored in the servers of various data warehouses. The magnitude of data is a lot. For instance we have over 1 trillion devices today, from 300 million devices over eight years and on top it as of 2012, humans and machines have generated almost 2.5 quintillion bytes of data every day. For every byte of structured data that is being properly mined, it is said that there are 4 bytes more of unstructured data.

The significant point is, according to IBM, of all the digital data in the world today, almost 90 per cent was generated in the last two years alone. There is close to 3 zettabytes of data in the world today, and this is throwing up unprecedented challenges for organizations trying to make sense of it. So much so, that an entire industry is developing around 'Big Data'.

The ongoing dawn of the 'Internet of Things' (The Internet of things refers to sensors and intelligence embedded in items such as consumer devices or physical assets, connected to the internet) age has led to data deluge; both corporate entities - in sectors such financial services and insurance, healthcare, pharmaceuticals retail and manufacturing besides governments and individual users are churning out all this data. Trends such as the growing use of mobile devices and social media networks are generating considerable amounts of data on the individual users' side (UGC-user generated content) meanwhile driving data generation on the corporate side are factors such as regulatory requirements that mandate storing internally generated structured data in the financial services industry.

According to a report by storage solutions provider EMC, India will generate and share almost 40,000 petabytes (1petabyte=1000TB) of data in a year, and this figure is expected to surge 60 times to reach 2.3 Exabyte's (1Exabyte=1 million TB) in the next 10 years. Based on EMC's analysis, the growth rate of data in India is double the growth expected worldwide.

The proliferation of such large pools of data has led to the invention of a new industry term - big data. Big data, as defined by Gartner, has three primary characteristics - volume (amount), velocity (speed of creation and utilization), and variety (types and sources of unstructured data). In common terminology, big data refers to large datasets that cannot be addressed using legacy data-management tools. Such datasets require next-generation techniques and technologies to aggregate, manipulate, analyze and visualize big data.

As it is popularly said that Big Data is supposed to be new oil. It has the power to transform global economies, make businesses more efficient and effective, leading to improvement of customers' daily interactions. The reason for calling like oil is, data is not truly valuable until it has been refined further analyzed and some valuable action is extracted from it.

Again to quote from Mr. Alex 'Sandy' Pentland, "Big data is about connected and linked data. In that light, the flow of information is central for understanding and building this new world. Not only is this because timely information is critical to efficient systems but, more importantly, because the spread and combination of information is the basis of innovation. When we use big data to look beyond aggregates (such as markets, classes and parties) and instead examine the fine-grain patterns of society, new opportunities and discoveries emerge. With these discoveries, we can deliver greater innovation, transparency, stability in market behaviour and improved social outcomes. Just as importantly, data analytics provide unprecedented instrumentation for how policies are performing so they can be quickly adjusted". It is becoming the mapping of what we do moment to moment. It is moment-to-moment sociology. Its moment-to-moment anthropology, it becoming more moment-to-moment mapping (Houle et al 2012).

The processing stages of Data are said to be involved in three waves. Today, most companies find themselves in the first evolutionary wave only, where data and analytics are siloed within specific business processes. In Wave 1, the result of data analytics is typically limited to a report delivered after the fact. In Wave 2, data gains power as broader sets of information are collected and analyzed, resulting in better decision-making and action. However, the greatest value comes with Wave 3, where data is collected, shared, and processed across an entire ecosystem. Enterprises can enrich their own data with a myriad of third-party data for example; weather patterns, economic indicators, retail sales patterns, or social media traffic to create more value for themselves and their customers. Cisco's Internet Business Solutions Group (IBSG) illustrates the Big Data evolving along three waves and across the three dimensions of data, control, and consumer by taking the example of a typical pharmacy chain. For example as per Wave 1, a single store may gather customer information and use analytics to create reports the manager can employ to plan inventory and future promotions where it may not be clear to consumers how their data is being used and what control they may have, so they are generally suspicious of any use of their personal data.

To really make a difference to businesses and consumers, Big Data needs to go much further in creating value. Here we have Wave 2, in which the pharmacy might gather more data from other store locations into a common data warehouse to discover new insights across a broader set of customers. Then, automated processes could update the supply chain based on those analyses. Finally, consumers may be given the option to opt-in to in-store marketing in order to receive incentives and information, involving them in the process and enabling them to make better in-store decisions. In the final Wave 3 scenario the pharmacy might learn through third-party data that a number of young, affluent couples with newborns live in their area. On the data plane, the pharmacy could federate data with other pharmacies, retailers, and ecosystem members. On the control plane, the pharmacy could track various brands of diapers and formula, identify which ones are the most likely to be in demand by these customers, and adjust their orders in real time based on predicted customer behavior. Finally, but potentially most transformative, once consumers have full transparency on the use of their data and have the power to influence how it is used, they may be more willing to share information with trusted parties, like the pharmacy, in exchange for recognizable value.

Mike Hagstrom, executive vice president, SAS feels that big data and its ability to understand patterns, spot trends, and evolutions makes it one of the most significant technology revolution or as he says, "this may be as big as steam engine's evolution." "Organizations do not have the big data problem. Rather if you look at the source of data you will see that data created internally is not growing fast, data explosion is coming from unstructured data. The challenge in front of these companies is to bring these two data together and interpret it," said Hagstrom. "When we combine these two worlds of largely structured and literally unstructured data , providing a window to wealth of opportunities to tackle issues like unemployment to health issue, demographics, budget deficits, and other global issues that public policy is finding it difficult to address," he added. One of the recent study undertaken by United Nations Global Pulse identified how social media and online user-generated content can be used to enrich the understanding of the changing job conditions in the US and Ireland. The analysis revealed that increased chatter about cutting back on groceries, increasing use of public transport and downgrading one's automobile could indeed, predict and unemployment spike.

BPO 4.0 AND BIG DATA BUSINESS MODEL

IT-enabled BPO is relatively a big business opportunity for India for the last 15-20 years, but IT's role is largely seen as an enabler of efficiencies. The IT infrastructures that support BPO is to be fine-tuned to cut costs, but the best-performing BPO

deals are nowadays using IT to innovate. Cloud computing and business analytics are set to inject new life into the BPO sector through reduced upfront costs and better use of the data. In the past, a business would have to buy licenses and install heavy-duty business applications as part of a BPO deal, but today they can sign up to cloud-based services and easily scale up and down the number of users. It allows companies to set up and run technology with a different total cost of ownership (TCO) model. Thus, BPO industry has evolved largely, with its reach expanding to different geographies and verticals with new customers being acquired and new technology and strategies are being implemented. India has reached the top spot in this outsourcing landscape in the world, with close to 52% share in the global market in 2012.

The global sourcing market revenue reached around 130 billion US dollars. A rapid evolution took place in the BPO industry in India, with both organic and inorganic growth being witnessed rampantly. This was marked by the emergence of Indian MNCs having around 580 centers across the world in as many as 75 countries. The financial year 2013 witnessed a significant transformation with the IT/BPO sector focusing on enterprising solutions rather than mere services. The clients expect much more than services and expect the industry to guide them through the best aspects. In addition, these solutions have been developed by largely leveraging SMAC (which includes smart, mobile, cloud and analytics). These solutions offer multiple benefits in terms of profit margins, cash flows, revenues, and others.

Technology is also providing increased value from BPO relationships. The use of the latest business analytics software enables businesses to get more from the data being handled within BPO relationships. In the software-as-a-service (SaaS) businesses model BPOs can introduce the applications used in BPO agreements without the need for large upfront payments whereas if the cloud is to offer massive BPO savings through platform-as-a-service (PaaS), BPO suppliers need to invest more in cloud platforms.

Global Services, a Cyber Media publication, hosted the 11th annual BPO Summit this week at Gurgaon on September 20, 2012, the father of the Indian BPO Raman Roy, Founder & CMD, Quatrro Global Services pointed out that the BPO industry is moving to a new phase that he called 'BPO 4.0'. "It is a phase of disruptive innovation and everything depends on how the BPO industry makes use of the opportunity".

It started slowly, with first-generation BPO consisting of "lift and shift" operations, which included data entry services. Second generation business process outsourcing focused more on continuous improvement, and evolving BPO's breadth to include multilingual services. Third generation BPO added visibility and communication to the equation as service providers look for ways to continue to add value to the outsourcing function. As we shift from third-generation into fourth-generation BPO, the pressure is on the service providers to add the value where We are expected to move from a more even balance between people, process and technology in the value proposition Fourth generation BPO will thus further utilize technology across its fields and would be focusing immensely on analytics.

FOURTH GENERATION BPO 4.0 REVENUE MODELS

Indian IT outsourcing vendors have moved well beyond the cost and process efficiency model towards outcome-based models, which is being paid on performance like improving total sales, working capital reduction, bottom-line improvement, etc., rather than the one based on the number of people deployed. This model is best suited when the cost of change management is high or when there is an under-utilization of people. It is also best suited when the outcome is process-oriented and when the customer have accurate baselines, well-defined, measurable service levels and performance goals, and be willing to accept the provider's solution to meet requirements.

This model is more vendors driven and they try to complete the work as soon as possible, using the most efficient processes and reducing costs. The vendor is relying on client and client on vendor for outsourcing success and risk is transferred from client to vendor. Vendor should account for transference of risk and cover that by including a risk premium in the price. Indian Vendors have realized that the golden age of T&M and throwing people at a problem has ended and they have already moved into fixed-cost deals and outcome-based contracts are the next step. In a survey conducted by InformationWeek in early 2008, 20% of 430 IT pros working with Indian outsourcers cited the "ability to tie project costs to business goals" as a key benefit that would prompt them to work with an outsourcer again. 31% cite "understanding our business and industry" as an area that is improved significantly over the past year. Indian Vendors were focusing more to understand the clients business as whole and not restricting themselves only to the IT department.

In 2008, Outcome based contracts or pricing was in a nascent stage where IT vendors just started to understand the significance of this model and how they are going to adapt this model. Businesses too due to the financial crisis and budgetary pressures started to work closely with vendors and provide them access to their business so that the vendors become a strategic partner who will help them in achieving the organizational goals.

Indian BPO firms have started offering knowledge-based services slowly moving away from voice based and transaction based services. These firms have also slowly started changing their pricing models and they are moving away from fixed fee outsourcing arrangements to outcome based pricing. Still 90-95% of the outsourcing functions are fixed fee based and only 5% follow outcome based pricing and it is strongly predicted that this scenario will change and the share of outcome based

outsourcing arrangements will be 40-50% in next 5 years. More and more BPO firms like HCL Technologies, ACS, and BancTec have now started offering outcome based pricing.

Outcome based pricing models are adopted when the focus of business organization is not merely to cut cost but to have an impact which is measurable looking at the end business result. This pricing model is mostly used when the customer and the service provider work towards a common goal and they have a common interest.

This type of pricing model is apt when:

- There is under utilization of people.
- Cost of change management is high.
- The outcome of business is process oriented rather than business oriented.
- The outcome is based on meeting deliveries or deadlines.
- The risk associated with the project is partially in control.

The critical factors, which need to be considered by BPO firms before executing this pricing arrangement, are indicated as below:

- Business model of the customer should be clearly understood.
- An in depth study should be done about the industry on the operational aspects of the company.
- The risk involved in the business should be well understood and should be factored.
- All the variables, reports, data and the way pricing is going to be done should come as part of the contract.
- The customer and the service provider should work simultaneously towards the common goal.

A strong relationship between the service provider and the customer is the pre requisite for the successful implementation of this pricing model. The service provider should clearly understand the risk involved in undertaking such a process and should estimate the cost involved in providing such a service.

Outcome based pricing model is nowadays not only finding application in business processes but also in technical processes. Business processes involve support for live tech applications and technical processes involve maintaining an uptime of 99.7%. The model is considered to be apt for use in BPO's, as in this industry especially for voice-based services, the payment is based on number of calls, which have been successfully converted. Data Analytics is today emerging as a popular trend today and is being adopted by a number of companies, to streamline businesses. There is also a notion that the future of businesses depends more on 'big data' and companies that adopt big data as a platform are seen challenging their competitors with a better performance.

The concurrent developments in the field of data analytics include predictive analytics, smart data, data science and new SQL.

- **Predictive Analytics:** The field of predictive analysis is currently behind everything and it includes statistical techniques, and other fields.

- **Smart Data:** 'Smart Data' is a term that is all set to replace 'big data' in a short time, and this is a sure indication that the word itself will become overused in less time. It is more about monetizing data through predictive analytics.

- **New SQL:** It is used to describe highly scalable and distributed SQL systems.

- **Data Science** – the field of data science employs advanced statistical techniques, language processing, and machine learning and computer science to enable extracting more data.

Many Indian companies in the BPO industry have begun moving their operations to many other viable locations abroad such as Egypt, Philippines, Canada, and China etc. resulting in the shift of a significant number of BPO jobs to those locations as well. India missing its global market share in the BPO industry has been leveraged by other countries with several of them emerging as popular BPO destinations.

Indian BPO companies need to create a balance to effectively address challenges and explore opportunities. From a client perspective, companies need to formulate a strategic roadmap - this involves creating a big data strategy, training resources within an organization, breaking through silos and provisioning for data sharing. In addition, it is important that companies undertake systematic planning to determine the best possible tools and techniques for complex dataset analysis. From a vendor standpoint, IT-BPO companies in India need to gather momentum and tap the global big data market. Companies may revisit their M&A strategies to acquire appropriate assets in global markets. Take for example Wipro, which recently acquired Promax Applications Group, an Australia-based analytics company. In their quest against talent shortage, companies may also collaborate with academia to train and certify data scientists of tomorrow.

On October 16, 2012 Technology giant Hewlett-Packard's enterprise services division announced the launch of business process outsourcing (BPO) analytics services, designed to help organizations address the need for data-driven business insights, such as customer, supplier and market information by extracting data buried in employee emails, PowerPoint presentations, webcasts, instant messages and other unstructured data. With the service, HP BPO professionals analyze structured and unstructured data to derive insights, facilitate decisions and define recommended actions for businesses, and focus on providing practical, day-to-day analytical requirements. Services also leverage HP's suite of information management and analytics technology and applications offerings, a suite of services to architect end-to-end information strategies for management, governance, and analysis of data.

HP provides the hardware and software for firms to utilize big data, and is offering experienced analytics professionals to help clients structure and run a sustainable data-driven decision-making framework that drives competitive advantage. HP analytics professionals leverage technologies developed through HP Labs, the company's central research arm, as well as software from Vertica and Autonomy, both HP companies.

The approach starts with collecting relevant data, then determining the answers to what happened and why through analytic methodologies, tools and research. HP then delivers insights on why a result happened and uses predictive analytics to help clients determine what could happen.

The company offers full-service, industry-specific BPO solutions for functions, including finance, administration and customer-relationship management. For example, the CRM service provides the management and operation of contact centers whose agents handle inbound and outbound interactions with customers. Services are delivered through HP's network of global on-shore, near-shore and offshore contact centers. Small and midsize enterprises (SMEs) are waking up to the benefits big data can offer their business and are realizing the competitive advantage they can hold.

The big data market is right now oligopolistic in nature and dominated by a few major players namely, HP, Teradata, Opera Solution, Mu Sigma and Splunk Inc. These five players accounted for more than a 60% of the big data market in 2012-13.

KEY TECHNOLOGIES FOR BIG DATA

A wide range of technology is available to facilitate the aggregation, management and analysis of big data. While the list continues to expand, some of the key technologies currently available are as follows:

Table-1

Early Investors	Name Recognition
Distributed System	A system that comprises of several computers, each will work independently on part of a bigger and common computational problem. These computers communicate thro' a common network. Distributed systems are less expensive than single high-end computers, perform better and are relatively more reliable and scalable.
Hadoop	Hadoop is open-source software used to process complex and large datasets on a distributed system.
Mapreduce	MapReduce is a software framework used to process large datasets on certain kinds of problems on a distributed system.
Google File System	This is Googles Proprietary distributed file system, also used in Hadoop.
SQL	SQL is a computer language (query-based) used to manage data in relational databases.
Cassandra	This Open-source database management system is used to handle large datasets on a distributed system.

Sources: Authors Compilation

Indian IT players have also boarded the big data bandwagon. The Infosys SocialEdge platform generates actionable insights from big data for immediate use by firms. TCS has also zeroed in on big data as a key technology likely to shape the computing world of tomorrow. Cognizant is also looking at developing solutions to cater to the challenges that big data gives rise to. Many programs launched by the Indian Government, including the nationwide Unique Identification Authority of India (UIDAI) program, is providing IT players with the opportunity to market their big data services in the domestic market.

THE BIG DATA MARKET

The global big data market is well poised for extensive growth and companies have started recognizing the enormous potential of big data and have, thus, started tapping this space and its related analytic capabilities to gain operational efficiency.

Big Data in Today's Business and Technology Environment

- 2.7 Zeta bytes of data exist in the digital universe today.

- IDC Estimates that by 2020, business transactions on the internet- business-to-business and business-to-consumer – will reach 450 billion per day.
- Facebook stores, accesses, and analyzes 30+ Petabytes of user-generated data.
- Akamai analyzes 75 million events per day to better target advertisements.
- 94% of Hadoop users perform analytics on large volumes of data not possible before; 88% analyze data in greater detail; while 82% can now retain more of their data.
- Wal-Mart handles more than 1 million customer transactions every hour, which is imported into databases estimated to contain more than 2.5 petabytes of data.
- More than 5 billion people are calling, texting, tweeting and browsing on mobile phones worldwide.
- Decoding the human genome originally took 10 years to process; now it can be achieved in one week.
- Google was processing 25,000 terabytes of data (25 petabytes) a day.

The Rapid Growth of Unstructured Data

- YouTube users upload 48 hours of new video every minute of the day.
- 571 new websites are created every minute of the day.
- Brands and organizations on Facebook receive 34,722 Likes every minute of the day.
- 100 terabytes of data uploaded daily to Facebook.
- According to Twitter's own research in early 2012, it sees roughly 175 million tweets every day, and has more than 465 million accounts.
- 30 Billion pieces of content shared on Facebook every month.
- Data production will be 44 times greater in 2020 than it was in 2012.
- In late 2012, IDC Digital Universe published a report indicating that some 2.0 zettabytes of data will be created that year.

In other words, the amount of data in the world today is equal to:

- Every person in the US tweeting three tweets per minute for 26,976 years.
- Every person in the world having more than 215m high-resolution MRI scans a day.
- More than 200bn HD movies – which would take a person 47m years to watch?

Currently, global vendors such as IBM, Intel, and HP continue to dominate the big data market. Indian IT-BPO players are yet to ride this growth bandwagon successfully and are gain a strong foothold at the global level. As recently as five years ago, selling analytics to Indian clients used to be challenging. This trend is now changing, and the industry is witnessing growth in adoption; yet, it the market is yet to witness widespread deployment. Even on the M&A front, global giants such as Opera Solutions and IBM have been aggressive, while Indian players continue to lag behind.

OVERCOMING THE EXISTING CONSTRAINTS

The quest to draw useful insights from business measurements is nothing new. Big Data is a descendant of Frederick Winslow Taylor's "scientific management" of more than a century ago. Taylor's instrument of measurement was the stopwatch, timing and monitoring a worker is every movement. Taylor and his acolytes used these time-and-motion studies to redesign work for maximum efficiency. The enthusiasm for quantitative methods has waxed and waned ever since.

Big Data proponents point to the internet for examples of triumphant data businesses, notably Google. However, many of the Big Data techniques of math modeling, predictive algorithms and artificial intelligence software were first widely applied on Wall Street.

When we look at it from the point of view of technology strategy and data strategy, organizations tend to have rarely a pure-play data strategy focused exclusively on the data. It tends to be driven very much by a technology-led approach. Technology is always seen as a proxy for what is more often than not a fundamental data problem or a lack of a well-defined data strategy for the organization. Taking it to the next tier down, technology can often be the biggest barrier to progress in using data more effectively. There tend to be two primary problems: more often than not, these systems are two-dimensional. They are designed to take data in, to produce an output or an outcome. They are very rarely designed with access to data for data's own sake as part of the overall architecture. When you do want to answer, a data-specific problem or challenge you then need to extract the data at a point in time, move it into a different environment and work on the data but that does not maintain the consistency and accuracy of the data that sits within the core processing system. That is one of the challenges.

"The second challenge is that these systems, unless they are highly transactional, tend to be static in nature. Once the data is created it tends to be out of data almost at the point where it has been created because there is no persistent or consistent update of the data. Although it is a great enabler, technology itself can also be a huge barrier to driving effective analytics or effective decisions as a service at the point where decisions need to be made. This leads to the third problem. Although there is a lot of investment in analytics technology tools, most of the analytics that are conducted within organizations are siloed and tend to be

designed to provide specific answers to specific questions at certain points in time. These are usually backward-looking and historical rather than forward-looking and predictive."

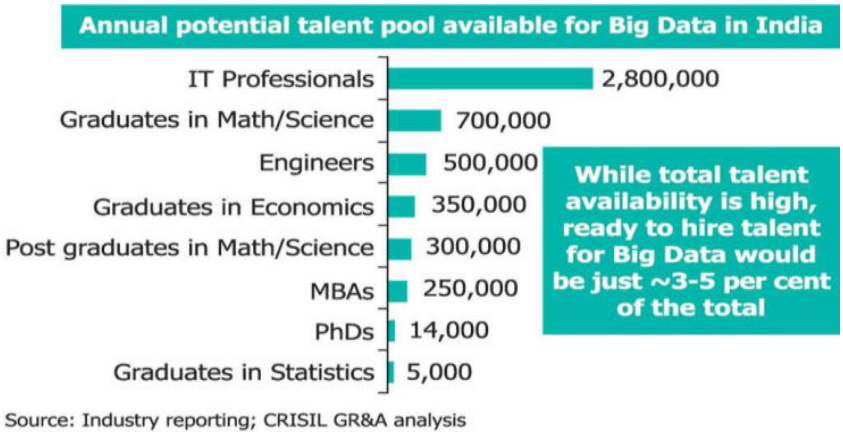
A further significant issue is the lack of key skills in the marketplace to enable organizations to exploit the value of data through advanced analytics. More often than not, because organizations tend to work in silos, trying to get alignment across different stakeholder groups with different agendas can be quite a challenge. Having an external partner that can take the problem away from you both in technology leverage terms and by providing access to essential skillsets on demand can be hugely beneficial.

It is about creating an environment that can be persistently updated by internal data, external data, unstructured data made structured, and media messaging and so on. It is about creating a technology environment that can consume that level of data in a real-time way. It is also about being able to look across different sectors, different geographies and comparator peer groups and then drive out benchmark reports or benchmark indicators as to where a particular organization compares to a norm or to other best practice industries. Beyond that, what a BPO provider has the ability to do is maintain a center of excellence approach that allows analytics outcomes to be delivered back online and in real time, rather than static reports.

"If, for example, an organization has a problem with duplicate payments or cash flow leverage, simply giving them a report that tells them there is a problem and quantifies the size of the problem is no longer enough: they need help in order to either recover the duplicate payments amount or take the necessary actions to improve their cash flow position. A BPO provider with a very strong financial accounting and back office outsourcing infrastructure can very easily scale up to not only implement the results of the analytics exercise but to recover revenue leakage or to enhance or make the changes necessary to improve the organization's working capital position to release cash."

However, the major constraint will be the availability of work force. MBAs, software engineers and statisticians are individuals with differing skill sets, but, big data analytics requires an individual to combine the capabilities of a statistician, a software engineer and an MBA, the pool of individuals who combine such complementary skill sets is insignificant when compared to the needs of the industry. Fig 1 shows the Talent pool available.

Figure-2



Sources: Author Compilation

Limited talent availability and low awareness about the benefits of Big Data analytics, however, are expected to inhibit the growth of the market in the future. The US market alone is expected to face a shortage of 1.5 million data-savvy managers and over 150,000 data scientists in 2018. In this respect, India has an early mover advantage vis-à-vis other outsourcing destinations such as China, Poland and the Philippines, in creating a robust Big Data workforce, and meeting this shortfall.

In order to improve talent availability for Big Data, IT organizations like EMC, Oracle, IBM, Infosys, etc., are leveraging their academic alliance programmes, with universities in India and overseas to introduce courses in various areas related to the domain. Private IT training institutes in India such as NIIT and Aptech are also developing talent through courses specific to Big Data.

The result is that India is expected to emerge as a preferred destination for analytics and IT services in the years ahead.

BIG DATA: THE ENCOURAGING SIDE

At this year's IBM PartnerWorld Conference here, the focus was on making sense of this humongous volume of data. The Cheesecake Factory was the poster boy at the event. This huge food chain, which has over 175 restaurants in the US and three in

West Asia, uses IBM's Big Data analytics to provide quality service to customers. As each restaurant makes around 200 dishes and the outlet serves more than 80 million people annually, data analytics is critical for the chain.

The information ranges from moving food at the appropriate temperature to making sure that fresh food is available to ensuring that products on sale are within the expiration date.

Angela Nardone, chairman and chief innovation officer of N2N Global, an IBM Partner, said, "The Cheesecake Factory has been making use of the IBM solution to pass on critical information to a large number of restaurants, like getting rid of ingredients that don't conform to high standards of quality and consistency or removing an item that has been withdrawn."

Donald Moore, chief culinary officer for The Cheesecake Factory, said that their ultimate goal was to deliver the best dining experience. "It is critical that we have the tools to ensure a fantastic dining experience for our guests in every restaurant from Beverly Hills to Kuwait City," he said.

If an ingredient does not meet the required standard on taste, colour or consistency, then it is conveyed immediately, instead of manually inputting and accessing the information, thereby saving time and scaling up efficiency. At the conference, IBM launched a number of technologies to help partners turn mounds of data to actionable insights. For example, partners will get one-year free access to cloud based IBM Digital Analytics to identify patterns in customer preference and turn real-time marketing strategies to satisfy customers better. Yet another example is about the 'Ready for IBM MobileFirst' initiative. In healthcare, it makes vital parameters of a patient available via mobile devices to experts to facilitate quicker and more accurate diagnosis. In banking, customers can make financial transactions and even deposit cheques via mobile phones fuelling revolution that is more mobile.

Few things in life are wholly good or wholly bad, and Big Data is no exception. Vahe Katros, a Palo Alto-based retail industry consultant with extensive experience in mining Big Data, uses a hypothetical retail industry example to illustrate how Big Data adds dimensions to the decision-making process. "If an apparel retailer knew that red shirts were not selling in the early part of the season in Hispanic markets in Miami but they were selling in L.A., they needed to have a system to move the merchandise around," says Katros. "However, Big Data provides two new dimensions, the How and the Why, and using that data is both the challenge and the opportunity."

Katros continues with the red shirt example to show the potentially positive side of Big Data. "If I'm selling red shirts, and it somehow suggested a cultural insensitivity, in a world of word-of-mouth, that aspect of your brand gets amplified and amplified quickly," says Katros. "Big Data gives you the raw materials to mine conversations; identifying the conversations that matter is the challenge."

Katros adds that when mining consumer conversations around your brand, it particularly helps to look for highly polarized sentiments, like comments that have love and hate sentiments. "Comments that have a high number of 'likes' – that means the folks agree with the positive or negative sentiments," he says. "These conversations are early indicators of your audience feelings and could also reveal whether swing voters are about to go negative. That's worth looking at, and you can find that information in Big Data – in conversations that happen in reviews, in Facebook conversations, comments, emails." Katros also points out that when analyzing those feelings, a small indicator can be hugely valuable. "Thinking in terms of politics, some say the success of Bill Clinton in 1992 was due to sticking with simple messaging, such as the famous line, 'It's the Economy, Stupid,'" he explains. "It's those kinds of lines that might be mined out of a Twitter stream."

ENSURING A POSITIVE BIG DATA OUTCOME WITH INDIAN OUTSOURCING

Management of Big Data touch points, i.e., the front end and systems in the back end, will eventually become an operational system like any other operational system. However, the strategic value comes from synthesis of raw data. If companies spend their time and effort cobbling together and maintaining collection systems, then they will rob from time they should be spending developing knowhow around making sense of this new data.

The collection of customer information is typically valued at an hourly rate, while the process and design of the data collected is valued as core intellectual property. Some of the promising recent Indian startups are given below. Top engineers from Google, Yahoo! and Facebook teamed with an Oracle executive to launch Cloudera in 2009. Now, Cloudera is a leader in Apache Hadoop-based software and services and offers a powerful data platform that enables enterprises and organizations to look at all their data structured and unstructured and ask bigger questions. Cloudera received its first round of funding worth $5 million from Accel Partners and then raised its next round of funds to bring the total to $140 million (from Ignition Partners, Greylock Partners, Meritech Capital Partners, and In-Q-Tel apart from Accel) Some of the clients that Cloudera caters to include eBay, Dell Secure works, Nokia and NetApp among others.

- Bizosys Technologies Pvt. Ltd. is a company based in Bangalore, which was co-founded, by Sunil Guttula, Abhinash Karan and Sridhar Dhulipala in early 2010. Bizosys provides IT solutions for clients and uses big data to solve scale and performance challenges. This company has developed several tools that are available free to use online or as open-source software with downloadable source code. Bizosys HSearch is a patent search technology built on Hadoop and

HBase to deploy in a distributed environment; especially suitable for Enterprise requirements of diversity, scale and security. Then there is enterprise support; enterprise support comes with tools and support for production. Bizosys team does production support. The pricing is at $25,000 for a 20-machine cluster and $50,000 for a 50-machine cluster. The pricing for larger deployment can be customized. Bizosys also offers a couple of solutions based on HSearch - Search Driven Portal and Scale on Demand details about which are available on the website. Bizosys is much bootstrapped and offers a value proposition at a substantially lower price-point than competitors, making it affordable for small companies. Bizosys' target market consists of startups and small to medium enterprises in the United States and Europe that outsource their custom software development work. The company currently has 175 registered users spanning 48 companies. Bizosys is among the brightest start-ups in India

- Bangalore based DataWeave provides easy-to-access data APIs over data that exists on the Web. It helps users discover, monitor and visualize public data on the Web in a uniform format: data APIs, dashboards and visualizations. Data examples that businesses find useful are pricing data and open data. The ideal of DataWeave is, "Data must be easily accessible and readily available to all users". Operational from April 2011, DataWeave creates datasets by aggregating data (both structured and unstructured) from disparate sources that are continuously changing, extracting relevant data from these sources and making them available through easy to use data APIs. Users get data in json format, now, but can be provided with data in any of the standard formats (xls, csv, xml …) currently, concentrating on two data verticals: Pricing data and open government data. PriceWeave.com, a price aggregation and monitoring engine, is the first product that has been built using DataWeave's API.

  As a whole, data sales is a $100B industry in the US. $2.3M worth applications are built using open data. With the Web as a distribution channel and including open data into their offerings, Dataweave feels this field can be disrupted. While US Companies likedatamarket.com, factual.com, semantics3.com necessarily operate in the same space, Dataweave concentrates on providing data related to the APAC region. Indiatimes Shopping, Easyration, Hoopos and Zigwheels are currently using their data APIs. Their customers fall broadly into the category of Application developers, Market research firms, Media organizations, Data Analysts and e-Commerce companies. The revenue generated is of a monthly subscription based model, where users pay for the number of API calls they make. Currently, they are working on their pricing model and create a pay-as-you-use model.

- Formcept is an effort to make content analysis accessible to everyone, be it an enterprise, an individual or a device. Formcept has products that are available both as Software as a Service (SaaS) and as installable products. The healthcare enhancement engine considers a medical record as a content item. The knowledge base that is used by the enhancement engine is built on top of DBpedia 3.6 and specifically these domains - Drugs and Diseases, Chemical Compounds, Species, Health, Microbiology, Medical Diagnosis, Medicine, Perception and Biology.

- A small team at Ciafo is developing Frrole, a Bangalore based startup. Apart from Frrole, Ciafo has two other products, both in the consumer web space. Frrole is a social newspaper built on top of Twitter, analyzes Twitter data city by city, filtering out 'noise' and pulling out 'information'. It currently covers 50+ cities in five countries. Using 10+ million tweets from these cities, Frrole creates a 'by the people, about the people' newspaper for each city, country and the world. Primarily, Frrole studies Twitter data and weeds out the noise to present the user with the most relevant and popular tweets. Now, from being a 'tweet listing' portal, Frrole has moved on to a richer 'news snippet' experience. After beta testing and tweaking, the layout, which the users have given thumbs up resembles Pinterest a bit but Frrole includes everything ranging from embedded videos to, photos to news summaries. Talking about scaling, from about twenty cities, Frrole now covers 50+ cities across 5 countries.

- Launched in 2009, Based in Bangalore PromptCloud is where "Big Data is made small". PromptCloud operates on a Data as a Service (DaaS) model and primarily deals with large-scale "custom" data crawl and extraction. This simply means that they crawl the web (gather data from various sources on the web) for product reviews, blogs, social media, hotel/travel sites etc. and structure this data into XML, CSV etc. which can then be either used directly or processed further according as the requirements of their clients. They crawl millions of pages and about a TB of data on a daily basis. They have provided more than 200 million reviews of products/hotels to clients across multiple domains and multiple geographies like US (primarily), UK, Canada, Germany, Switzerland, India, Singapore, Spain, etc. PromptCloud's market strategies are mostly made up of targeted email marketing and inbound marketing for which they leverage social media.

- Insieve aims at solving the problem of information overload, and allows for intelligent sharing of information. The startup currently is in private beta. The investment shall be primarily used for product development, business development and hiring. Ojas Ventures & Blume Ventures have co-invested in Bangalore based startup Insieve. Insieve is an intelligent information-sharing network. It has a product called Pugmarks that learns about the user from what their friends share. For instance, when you share information about car racing with say, Tom, Pugmarks learns that Tom likes car racing. The next time any of Tom's friends read something on car racing, Pugmarks will remind them about Tom.

CONCLUSIONS

According to estimates, the volume of business data worldwide, across all companies, doubles every 1.2 years and poor data can cost businesses 20%–35% of their operating revenue for instance bad data or poor data quality costs US businesses $600 billion annually. Big Data is a valuable business insight, which organizations can use to predict changes in client and market sentiment, identify the current state of business and new opportunities, quantify existing and potential risks, and automate decisions for real-time processes. Big Data also enables better customer segmentation, improved productivity and fraud detection across all industry sectors including the public sector, healthcare, financial services, retail, telecom, and manufacturing. Big Data analytics is gaining momentum the world over, with advanced techniques being applied on big datasets to answer questions previously considered beyond reach. Advanced analytic and visualization techniques are being used on datasets to uncover hidden patterns and unknown correlations for effective decision-making. Big Data management, analytics, IT services and applications constitute the Big Data ecosystem, while social media analytics, sentiment analysis and behavioural analysis are upcoming Big Data analytics services.

Organizations are increasingly leveraging insights provided by Big Data by delivering 'Big Data value' directly to consumers through data-driven applications. These applications can reside on PCs, smart phones, tablets or other web-enabled devices. India too, is reflecting these global trends, with several large IT services providers, and a host of new organizations specializing in Big Data industry gaining traction. Indian service providers are adding Big Data capabilities to their portfolios by leveraging M&As and go-to-market partnerships, and focusing on talent development. The opportunity for Indian service providers, including Global In-house Centers, pure play analytic firms and IT-BPO players lies in offering services around Big Data implementation and analytics for global customers.

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MAPPING THE SUCCESS OF SOFTWARE PROJECTS THROUGH EMPLOYEE ENGAGEMENT AND EMPLOYEE EMPOWERMENT

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ABSTRACT

Software projects are becoming more and more complex, dynamic in the current global scenario and consequently understanding the factors, which affect the success of such complex projects, become critical. Lot of research work has been done in this area, and high failure rate of software projects was reported. Employee empowerment and employee engagement are the factors considered for this study; this study tries to understand the impact of employee empowerment and employee engagement on the success of software project. Employee empowerment and employee engagement are measured through items. An e-mail questionnaire was used to gather the data.

The questionnaire measured all items on seven point likert scale, and multiple regressions was applied to find the impact of employee empowerment and employee engagement on software project success. Employee empowerment and employee engagement in a software project has impact on the success of the software project. 72.4% of the variation of Software Project Success is explained by employee empowerment and employee engagement. The data were collected from 150 respondents; the size of data can be increased for better result. Employee empowerment and employee engagement are only two factors considered in the paper to understand the software project success; other factors could also be combined to understand it in a better way. It could be studied in other countries as well.

The findings show the impact of employee empowerment and employee engagement on software project success, which will help project managers in handling the team in a better way, and management in providing improved working situation for the IT workers for good results in the software projects. Lot of work has been done to understand the factors affecting the success of software projects, but few studies have focused on people related issues, with special reference to employee empowerment and employee engagement in Indian context.

KEYWORDS

Software Project Success, Employee Empowerment, Employee Engagement, Software Professionals etc.

INTRODUCTION

Software project management is a sub-discipline of project management in which software projects are planned, implemented, monitored and controlled. According to Mike Wooldridge (2000) President and CEO, *Micro Solutions,* good project management cannot guarantee success, but poor management on significant projects always leads to failure. Many researchers in spite of the application of project management techniques (Mc Manus & Wood-Harper, 2008; Prinzo 2011; Riley, 2006) are reporting high failure rates.

As per (Saur & Cuthbertson, 2003) a survey in UK showed that there were sixteen percent successful projects, seventy four percent challenged projects and ten percent were abandoned projects. With the increased importance of cross-functional software packages, Enterprise Resource Planning (ERP) projects have also to be studied, for making their implementation successful. However, a survey in the USA revealed that seventy percent of companies implementing ERP consider the project successful. More than fifty-five percent of companies admitted that the planned budget was exceeded, by an average of sixty percent. When these budget overflows are counted as failures, the success rate of ERP implementations does not reach fifty per cent (Mabert Soni & Venkataramanan, 2000). All these facts create a need to understand and identify all the factors affecting the software project success.

Lot of work has been done to identify factors affecting the success of a software project, and importance of people related factors affecting have been recognized since nineties (McLeod, 1992). The commitment and motivation of people involved in the development process have a positive effect on the project result (Milis and Mercken, 2002; Mahaney and Lederer, 2003; Standing et al., 2006). If the team is committed, motivated, involved in decision-making and appropriately engaged the results of the project are excellent.

The Gallup Organization, because of 25 years of interviewing and surveying employees and managers, coined the term employee engagement, in its present usage. After Hundreds of focus group and thousands of interviews with employees in a variety of industries.

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Gallup came up with Q. 12, a twelve question survey that identifies strong feelings of employee engagement. They have identified 12 questions that most effectively measure the links (the Gallup Q12). Harter, Schmidt and Hayes (2002) define employee engagement as "the individual's involvement and satisfaction with as well as enthusiasm for work" (p. 269).

HR consulting firm (Hewitt Associates LLC, 2005, p. 1) indicates that they ''have established a conclusive, compelling relationship between engagement and profitability through higher productivity, sales, customer satisfaction, and employee retention.'' Some practitioners view engagement as having evolved from prior research on work attitudes, directly implying that this newer concept adds interpretive value that extends beyond the boundaries of those traditions. Three basic aspects of employee engagement according to the global studies are:

- The employees and their own unique psychological makeup and experience,
- The employers and their ability to create the conditions that promote employee engagement,
- Interaction between employees at all levels.

Thus, it is largely the organization's responsibility to create an environment and culture conducive to this partnership, and a win-win equation Doom, Milis, Poelmans & Bloemen (2009). Kahn (1990) defined engagement at work as ''harnessing organizational members' selves to their work roles''. Engaged people employ and express themselves physically, cognitively and emotionally as they perform their roles. The notion of flow, which Csikzentmihalyi (1975) advanced, is also related to employee engagement. Csikzentmihalyi defines flow as the ''holistic sensation'' that people feel when they act with total involvement. Flow is the state in which there is little distinction between self and environment. When individuals are in the state of flow, they need little conscious control for their actions.

SIGNIFICANCE OF STUDY

The study of employee empowerment and employee engagement in context of software project is important because the factors that affect the success of a software project are quite different from other engineering projects. Not only is this it important for management to focus on job satisfaction of IT professionals due to the dynamic nature of such projects and presence of virtual teams.

According to Cao, Xu, Liang, Chaudhry (2012) job engagement is extremely important for the success of e-business projects, as the teams are mostly virtual. Employee attrition constitutes substantial costs to IT companies, it contributes to the budget overflow, which indicates projected failure, and hence it becomes important to empower and effectively engage the IT workers (Korrapati & Eedara 2010).

LITERATURE OF REVIEW

Empowerment has expanded upon the concept of participative management. Involving team members in the decision-making, by the manager is recommended for project success.

Mallak and Kurstedt (1996) gave the model of empowerment which includes four concepts: intrinsically motivated behavior leading to, internal justification for actions taken whereby, management releases some of its authority and responsibility to other levels in the organization that deal directly with the product or, service integrating coworkers for problem solving.

Honold, (1997), highlighted Multi dimensional nature of employee empowerment, in the multidimensional approaches both the leadership component and the individual component will have an impact but individually they will not be able to explain project success. The multi-dimensional constructs given by them is:

- Leadership focused on the development of the individuals throughout the organization, creating a vision and developing common goals, and continually scanning the environment and adapting to it;
- Teams and collaborative working arrangements;
- Personal responsibility for performance exemplified in job autonomy, control over decisions directly relating to one's work;
- Decentralized structure of the organization;
- Contingent reward system.

Nah, Lau, & Kuang, (2001), sharing vision and accordingly planning the role of staff, helps in getting positive result in the project, highlighted the importance of sharing the organizational vision. According to them, corporate culture with common goals is not just sufficient but it has also required that open communication is encouraged and management should be flexible, so that team strongly identifies with the organization. Expectations from the team should also be communicated properly

While understanding the success factors, people related factors are considered equally important as following technological best practices. Cyboran (2005) highlighted the management empowerment and psychological empowerment of the technical team, for the project success. In the study conducted by him data were collected using convenient sampling from forty two non-

management knowledge workers, who were employees of a software organization headquartered at Midwest USA. Employee empowerment becomes critical in the current scenario, because of the dynamic nature of software projects.

Continuous research is being done to understand the impact of employee empowerment for Information Technology (IT) professionals. Kuo, Ho, Lin & Lai (2005) have investigated, and established the positive effect of work redesign on self-perceived psychological empowerment and organizational commitment.

Greasley, Bryman, Naismith & Soetanto (2007), has also emphasized psychological dimension of empowerment. According to them empowerment is understood by the employees as a mixed flavor of personal responsibility and control over their work. They conducted a qualitative study, by conducting semi-structured interview of forty-five non-managerial employees of construction project.

Tafti, Mithas, Krishnan (2007), indicated complementary relation between Human Resource (HR) policies and Information Technology (IT). According to them, it is important to give employees the autonomy and decision-making power necessary. This is required to take full advantage of the capabilities that IT provides, such as data- and information-gathering potential, the utilization of analysis tools, and collaboration across departments. The data were collected from a survey of Information System executives who participated in the Information Systems Executive Forum, an annual or biannual meeting of IS executives and faculty members held at the University of Michigan. Questionnaire was used for this purpose based on five point likert scale.

Schneider, Macey, Barbera, & Martin (2008) highlighted the concept of driving customer satisfaction and financial success by emphasizing the employee engagement. In order to derive the results data were collected from forty-four companies using customer focused engagement measures. These companies belonged to a broad range of service industries like airlines, telecommunications, retail, hotels and banks. Results revealed that for this sample the correlation between engagement behaviors as reported by employees and as reported by customers was .45 ($p < .01$).

Job engagement is extremely important for the success of e-business projects, as the teams are mostly virtual Cao, Xu, Liang, Chaudhry (2012). They developed a conceptual model to establish the relationship between tacit degree of knowledge, job engagement, team tasks, and their effect on knowledge transfer. Data were collected from employees involved in e-business development in China, with age between 25 and 40, where thirty-eight percent employees were division manager. The model was validated with the data collected. Pearson correlation coefficient was calculated to derive the result.

In today's scenario, where the software projects have become dynamic and teams are becoming virtual in nature, the need to understand the impact of employee empowerment and employee engagement becomes very critical. This paper aims to quantify this impact by applying regression on the data collected by using questionnaire based on Gallup and ….;

RESEARCH METHODOLOGY

Hypothesis of Studies

There a significant positive relationship between the success of software project and Employee Engagement and Employee Empowerment.

Research Design

The present research is causal in nature, trying to figure out the impact of Employee Engagement and Employee Empowerment on the success of the software project.

Sampling Design

The research was carried out in the software organization of India. We have taken the sample of IT professionals by dint of stratified random sampling resulting into total sample of 150. Respondents were given the self-administered questionnaire over electronic mail and were required to rate the questions on a seven-point Likert scale. Thirty questionnaires were sent to each IT organization and the final respondent participated in the study by returning the self-administered questionnaire was 150.

Data Collection Design

The data were collected from five leading IT firms of the country through a questionnaire where each item was measured in Likert scale. Tafti, Mithas, Krishnan (2007) also used likert scale, for this purpose. The Employee Engagement and Employee Empowerment are measured through a composite score of 20 items, which are as follows:

I. I was conscious about the expectations at my workplace.
II. I had sufficient availability of the materials and equipment required for work.
III. I had enough opportunity to exercise my core competency in the workplace
IV. I am recognized and praised for my contribution at the workplace

V. I receive a constant humane touch from my seniors and colleagues at my workplace
VI. I am encouraged at my workplace for my growth and development
VII. My opinion was accepted with great respect and value in the workplace
VIII. I relate myself with the mission/ vision of the organization
IX. My colleagues are equally motivated in contributing quality work
X. I enjoy the friendly relationships with my colleagues
XI. I receive regular guidance regarding my progress and development at my workplace
XII. I had regular opportunities at work to learn and grow
XIII. My participation was evident in the identification of the problem.
XIV. My participation was evident in requirement analysis and definition.
XV. My participation was evident in the estimation of time and cost.
XVI. My participation was evident during finalizing the functional specification.
XVII. My participation was evident while designing software architecture and making test plan.
XVIII. My participation was evident in coding and testing.
XIX. My participation was evident during release, delivery and installation of the software.
XX. My participation was evident during operation and maintenance phase.

Reliability of the variables are tested and it was found that the scales are highly reliable (Cronbach's Alpha >.75).

Statistical Design

Multiple regressions were used to assess the impact of Employee Engagement & Employee Empowerment on software project success, where software project success is the dependent variable and Job satisfaction is the independent variable. Rothmann & Rothmann (2010) measured employee engagement using regression. Bordin, Bartram & Casimir, (2007) used regression for measuring empowerment for IT workers.

Model and Variables Definition

The following model is used for testing hypotheses:

Success of the Project = $\beta_0 + \beta_1$ Employee Engagement+ β_2 Employee Empowerment

The variables are explained as following:

Success of the Software Project: Successful software projects are often defined as meeting business objectives; deliver on time and within budget, and meeting requirements (Nasir & Sahibuddin, 2011).

Employee Engagement: Schmidt et al.'s influential definition of engagement was "an employee's involvement with, commitment to, and satisfaction with work. Employee engagement is a part of employee retention." This integrates the classic constructs of job satisfaction (Smith et al., 1969), and organizational commitment (Meyer & Allen, 1991). Schneider, Hanges, & Smith's (2003) most recent meta-analysis can be useful for understanding the impact of engagement.

Employee Empowerment

- Empowerment is the period of improving the decision-making ability of the employees through cooperation, sharing, training, education and teamwork Vogt and Murrel (1990).
- Empowerment as the activity of assigning appropriate responsibility to employees and making them gain abilities (Klagge, 1998).

EMPIRICAL RESULTS

Descriptive statistic only portraits variables distribution and does not give information as to the relationships between variables. Research descriptive statistic is shown in Table 1.

Table-1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Success of the Project	150	2	7	5.81	1.097
Employee Engagement	150	2.60	7.00	5.6260	1.05814
Employee Empowerment	150	2.00	7.00	5.6042	.96756

Sources: Author Compilation

Correlation Matrix

The correlations among the variables are shown in Table 2. The high correlations between employee engagement (.829) and employee empowerment (.612) with the success of software project reveal that we have chosen a good set of independent variables. The correlation between the two independent variables is found to be moderate (.545).

Table-2: Correlations

		Success of Project	Employee Engagement	Employee Empowerment
Success of the Project	Pearson Correlation	1	.829**	.612**
	Sig. (2-tailed)		.000	.000
	N	150	150	150
Employee Engagement	Pearson Correlation	.829**	1	.545**
	Sig. (2-tailed)	.000		.000
	N	150	150	150
Employee Empowerment	Pearson Correlation	.612**	.545**	1
	Sig. (2-tailed)	.000	.000	
	N	150	150	150

Sources: Author Compilation
** Correlation is significant at the 0.01 level (2-tailed).

Table-3 given below reveals that the coefficient of employee engagement is significantly different from zero ($t = 13.652$, $p < .05$) and the coefficient of employee empowerment is also significantly different from zero ($t = 4.404$, $p < .05$) which indicates that both the independent variables leave an impact on the success of the software projects.

Table-3: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.246	.305		.806	.422
	Employee Engagement	.731	.054	.705	13.652	.000
	Employee Empowerment	.258	.059	.228	4.404	.000

Sources: Author Compilation
a. Dependent Variable: Success of the Project

Table-4 shows that the model is statistically significant ($F = 192.842$, $p < .05$) and both the independent variables i.e. employee empowerment and employee engagement taken together leave a significant impact on the success of the software project.

Table-4: ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	129.888	2	64.944	192.842	.000[a]
	Residual	49.506	147	.337		
	Total	179.393	149			

Sources: Author Compilation
a. Predictors: (Constant), Employee Empowerment, Employee Engagement
b. Dependent Variable: Success of the Software project

Table 5 reveals that 72.4% of the variation of the success of software project is explained by employee empowerment and employee engagement.

Table-5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.851[a]	.724	.720	.580

Sources: Author Compilation
a. Predictors: (Constant), Employee Empowerment, Employee Engagement

Once all the conditions of performing regression are satisfied, Table 3 is again investigated to extract the regression equation. Table 3 further reveals the regression equation explaining the impact of employee engagement and employee empowerment on the success of software projects which is as follows:

Software Project Success = -.020 + .731 Employee Engagement + .258 Employee Empowerment

DISCUSSION

The results show that both employee empowerment and employee engagement have high impact on software project success. While understanding the success factors, people related factors are considered equally important as following technological best practices. An engaged workforce form an emotional connect with the organization that helps them, to Infuse energy and positivity at workplace and go the extra mile to achieve individual and project success .

LIMITATIONS OF STUDY

The data were collected from 150 respondents; the size of data can be increased for better result. Employee Empowerment & Employee Engagement are only two of the factors affecting the software project success; other factors could also be combined to understand it in a better way. The study was conducted in only one country.

FUTURE WORK

This study analyzed data from 150 respondents for the result, sample size can be bigger. The future study could combine other factors like leadership, team building, risk management, testing etc to understand the reasons of success in a better way. It could be studied in other countries as well.

CONCLUSIONS

The failure of software projects can be reduced by taking care of the factors affecting the software project success. The results show that employee empowerment and employee engagement have high impact on software project success. A disengaged employee and the one and lacking empowerment is seldom able to shake off the lethargy and perform in the current organization or land a job of preference. Taking care of these factors becomes all the more important when the projects are global and team is virtual and culturally diverse.

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IMAGE ENHANCER

Mohit Tandon[4]

ABSTRACT

Image noise is a random, usually unwanted, variation in brightness or color information. Image noise is most apparent in image regions with low signal level, such as shadow regions or under exposed images. In this paper, we deal with this problem, by describing the Image Enhancer, which involve, different image enhancement techniques to get the improved quality image or uncover the hidden details.

KEYWORDS

Digital Image Processing, Computer Graphics, Image Enhancer , Image Noise etc.

BACKGROUND

Digital Image Processing

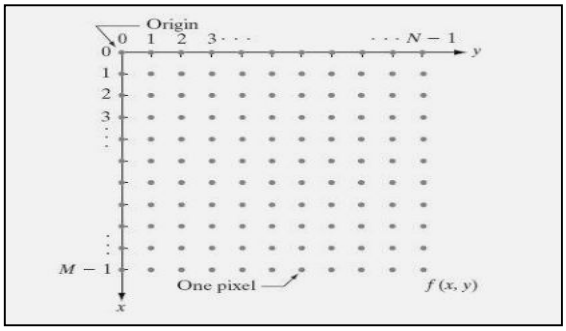
The field of digital image processing refers to processing digital images by means of a digital computer.

An image may be defined as a two-dimensional function, f(x, y), where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x, y) is called the intensity or gray level of the image at that point. When x, y, and the amplitude values of f are all finite, discrete quantities, we call the image a digital image. A digital image is composed of a finite number of elements, each of which has a particular location and value. These elements are referred to as picture elements, image elements and pixels. Pixel is the term most widely used to denote the elements of a digital image.

Representing Digital Image

Assume that an image f(x, y) is sampled so that the resulting digital image has M rows and N columns .The values of the coordinates (x, y) now become discrete quantities. For notational clarity and convenience, we shall use integer values for these discrete coordinates. Thus, the values of the coordinates at the origin are (x, y) = (0, 0).The next coordinate values along the first row of the image are represented as (x, y) = (0, 1). It is important to keep in mind that the notation (0, 1) is used to signify the second sample along the first row. Figure below shows the coordinates.

Figure-1: Coordinate Convention



Sources: Authors Compilation

The notation introduced in the preceding paragraph allows us to write the complete M*N digital image in the following compact matrix form:

(1)

$$f(x,y) = \begin{bmatrix} f(0,0) & f(0,1) & \cdots & f(0,N-1) \\ f(1,0) & f(1,1) & \cdots & f(1,N-1) \\ \vdots & \vdots & & \vdots \\ f(M-1,0) & f(M-1,1) & \cdots & f(M-1,N-1) \end{bmatrix}$$

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Noise

Image noise is a random, usually unwanted, variation in brightness or color information. Image noise is most apparent in image regions with low signal level, such as shadow regions or under exposed images. There are different types of noises as:

Salt-and-Pepper Noise: Fat-tail distributed or "impulsive" noise is sometimes called salt-and-pepper noise or spike noise. An image containing salt-and-pepper noise will have dark pixels in bright regions and bright pixels in dark regions. This type of noise can be caused by dead pixels, analog-to-digital converter errors, bit errors in transmission, etc.

Shot Noise: The dominant noise in the lighter parts of an image from an image sensor is typically that caused by statistical quantum fluctuations, that is, variation in the number of photons sensed at a given exposure level; this noise is known as photon shot noise. Shot noise has a root-mean-square value proportional to the square root of the image intensity, and the noises at different pixels are independent of one another. Shot noise follows a Poisson distribution, which is usually not very different from Gaussian.

In addition to photon shot noise, there can be additional shot noise from the dark leakage current in the image sensor; this noise is sometimes known as "dark shot noise" or "dark-current shot noise".

Amplifier Noise (Gaussian Noise)

The standard model of amplifier noise is additive, Gaussian, independent at each pixel and independent of the signal intensity, caused primarily by Johnson–Nyquist noise (thermal noise), including that which comes from the reset noise of capacitors ("kTC noise"). In color cameras where more amplification is used in the blue color channel than in the green or red channel, there can be more noise in the blue channel.

Quantization Noise (Uniform Noise)

The noise caused by quantizing the pixels of a sensed image to a number of discrete levels is known as quantization noise; it has an approximately uniform distribution, and can be signal dependent, though it will be signal independent if other noise sources are big enough to cause dithering, or if dithering is explicitly applied.

Non-Isotropic Noise

Some noise sources show up with a significant orientation in images. For example, image sensors are sometimes subject to row noise or column noise. In film, scratches are an example of non-isotropic noise.

OBJECTIVES OF INVESTIGATION

The Image Enhancer is a field totally based on Digital Image Processing that allows the user to choose the desired image and enhance it. Not all images can be enhanced by a particular technique or a particular sequence of techniques. If one image can be enhanced by sharpening, then other can be enhanced by smoothing. This depends on the condition of the image, which cannot be judged by the computer. Therefore, user's assistance is required. Moreover, level or extent of enhancement also depends on the viewpoint and the requirement of the user, may be the user want to get the improved quality image or may be the quality of the image does not matters but the user want to uncover the hidden details.

This paper actually emphasis on investigation of different image enhancement techniques.

The main objective is to do research on different image enhancement techniques and then try to implement it on the digital images.

Following are the functions that will be are investigated as:

- How to perform Global Histogram Equalization on user's choice of images?
- How to perform Local Histogram Equalization function on user choice of options?
- How to perform smoothing using Median Filter on user's choice of images?
- How to perform smoothing using Adaptive Noise Reduction Filter on user's choice of images?
- How to perform sharpening using Unsharp filter?
- How to perform conversion form color image to grayscale image?
- How to perform conversion form grayscale to binary image or color image to binary image using Basic Global Thresholding?
- How to provide option for applying all these methods only on a particular portion of the image?

REVIEW LITERATURE

Image Enhancement Techniques

The techniques are smoothing, sharpenening, histogram equalization, adaptive histogram equalization etc.

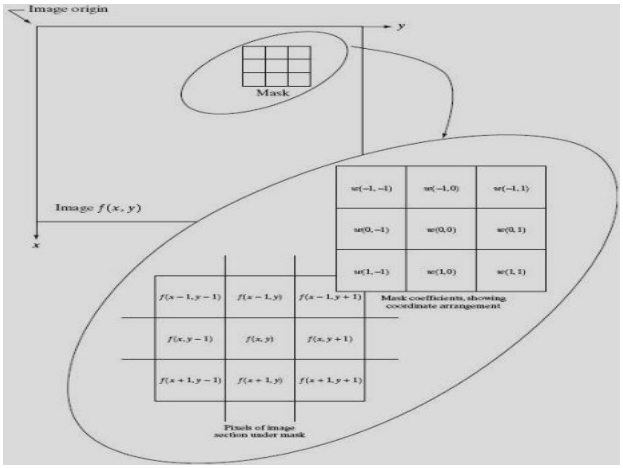
Image Filtering

Filtering refers to accepting or rejecting certain frequency components. Filtering can be of two types: spatial filtering and filtering in frequency domain. Spatial filters offer considerably more versatility as they can also be used for non-linear filtering, which cannot be done in frequency domain. In this project, spatial filtering is used as spatial filters much depend on the image pixels and their arrangement .That is why spatial filters will most suit to the user's choice. Spatial filter consists of a neighbourhood and a predefined operation that is performed on the image pixels encompassed by the neighbourhood. This neighbourhood is called a sub image or filter mask. Filtering creates a new pixel with coordinates equal to the coordinates of the center of the neighbourhood and whose value is the result of the filtering operation. The value of new pixel is given by the following equation:

$$R = w(-1,-1)f(x-1,y-1) + w(-1,0)f(x-1,y) + \cdots + w(0,0)f(x,y) + \cdots + w(1,0)f(x+1,y) + w(1,1)f(x+1,y+1)$$

The figure below shows the mechanics of spatial filtering using a 3*3 filter mask.

Figure-2: Spatial Filtering



Sources: Authors Compilation

Image Smoothing

Smoothing an image means applying smoothing filter to the image. Such filter is also called lowpass filter. Smoothing filters are used for blurring and noise reduction. Blurring is used in preprocessing tasks, such as removal of small details from an image prior to object extraction and bridging of small gaps in curves or lines.[14] Following figures illustrates the image smoothing. Figure given below is the noisy image with salt and pepper noise in it. Figure given below represents smoothed image with salt and pepper noise removed in an effective way. To remove salt noise we use min filter and to remove pepper noise we use max filter.

Figure-3: Noisy image

Sources: Author Compilation

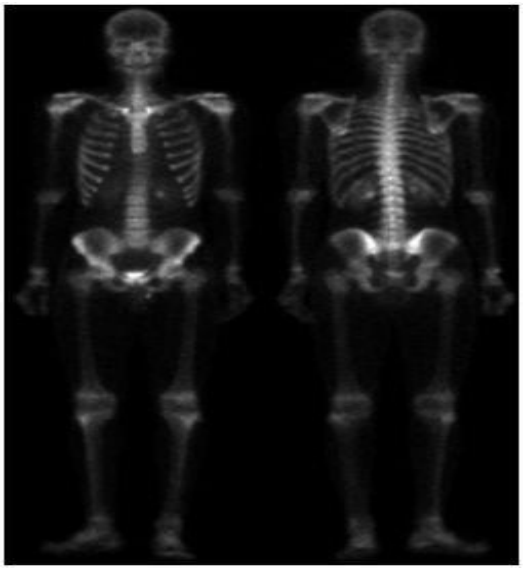
Figure-4: Smoothed Image

Sources: Author Compilation

Image Sharpening

Sharpening an image means applying sharpening filter to the image. Such filter is also called highpass filter. The principal objective of sharpening is to highlight transitions in intensity. Its use includes applications ranging from medical imaging to industrial inspection and guidance in military systems. Following figures show the result of sharpening.

Figure-5: Actual Image



Sources: Author Compilation

Figure-6: Sharpened Image

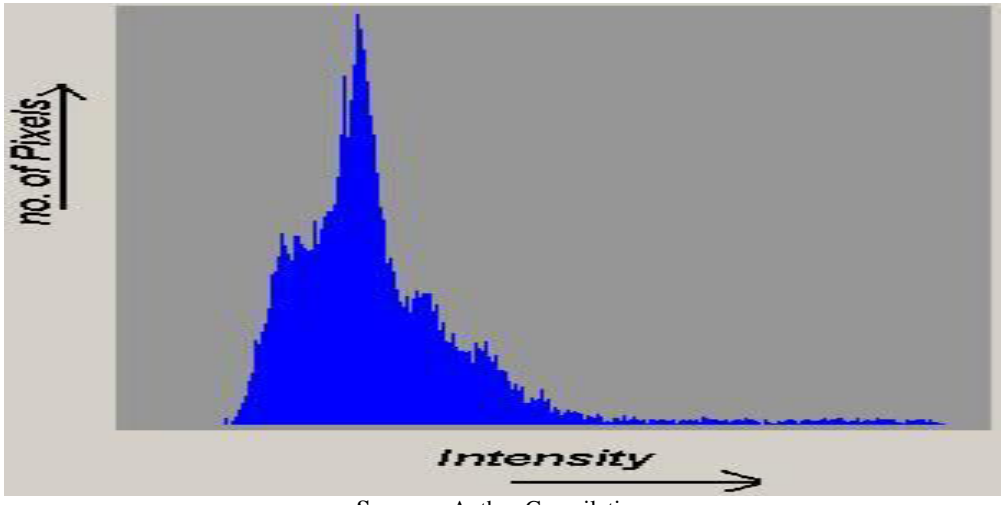
Sources: Author Compilation

Histogram

Histogram is a discrete approximation of stochastic variable probability distribution. It is a graphical display of tabulated frequencies. It is the operation by which the occurrences of each intensity value in the image is shown. The histogram in the context of image processing is the operation by which the occurrences of each intensity value in the image is shown. Normally, the histogram is a graph showing the number of pixels in an image at each different intensity value found in that image.

For example: For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. The histogram of an image looks like the figure below:

Figure-7: Histogram

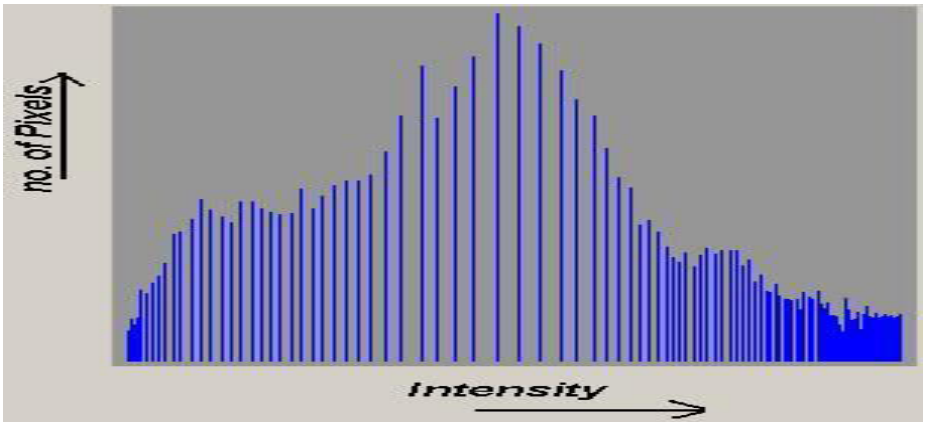


Sources: Author Compilation

Equalized Histogram

Equalized Histogram assigns the intensity values of pixels in the input image such that the output image contains a uniform distribution of intensities. The equalized histogram of an image looks like the figure below:

Figure-8: Equalized Histogram



Sources: Author Compilation

Here, in this figure we can see that we have approximately same peaks and valleys but shifted at different position. This can be categorized into two methods:

Global Histogram Equalization (GHE)

In global histogram equalization, the histogram of whole input image is first obtained, then the Cumulative Distribution Function (CDF) is calculated, and a grey transfer function is derived from the CDF. Though it is very simple, it does not take account of local image information, and often cause some contrast losses in small regions.

Adaptive Histogram Equalization (AHE)

To overcome the above-mentioned shortcoming, a local adaptive histogram equalization method has been developed. In this method, a contextual region is first defined. Histogram of that region is obtained, and then its grey level transfer function is derived from its CDF. Thereafter, the center pixel of the region is histogram equalized using this function.

The center of the rectangular region is then moved to the adjacent pixel and the histogram equalization is repeated. This method allows each pixel to adapt to its neighboring region, so that high contrast can be obtained for all locations in the image. This technique has one problem, as it is time consuming. So in order to solve this problem we use another approach that do the same thing but in time saving manner.

Following figures compare the result of global histogram equalization and adaptive histogram equalization.

Figure-9: Original Image

Sources: Author Compilation

Figure-10: Equalized Image

Sources: Author Compilation

Figure-11: Adaptive Equalized Image

Sources: Author Compilation

ALGORITHM AND FLOW CHARTS

Basic Global Thresholding

This technique is used to convert color or grayscale images into binary images. The main aim is to choose the threshold according to the selected image, so that much better result is obtained. The basic global threshold, T, is calculated as follows:

- Select an initial estimate for T (typically the average gray level in the image).
- Segment the image using T to produce two groups of pixels: G1 consisting of pixels with gray levels>T and G2 consisting pixels with gray levels≤T.
- Compute the average gray levels of pixels in G1 to give μ1 and G2 to give μ2.
- Compute a new threshold value.
- Repeat steps 2-4 until the difference in T in successive iterations is less than a predefined limit T∞.

Median Filter

The median filter is a non-linear digital filtering technique, often used to remove noise from images or other signals.

Algorithm for median filter:

- Check window size
- Pad image
- For each pixel
  - Create sub image
  - Calculate median for that sub image
  - Assign this value to the central pixel
- Remove the padding

Adaptive Local Noise Reduction Filter: Algorithm:

- Calculate the variance of the whole image.
- Check window size
- Pad image
- For each pixel
  - Create sub image
  - Calculate the variance of the sub image
  - Calculate mean of the sub image
  - compute the new value of the central pixel as
    Old_value – ((image_variance/sub_variance)(old_value -sub_mean))
- Remove the padding

Unsharp Filter: Algorithm:

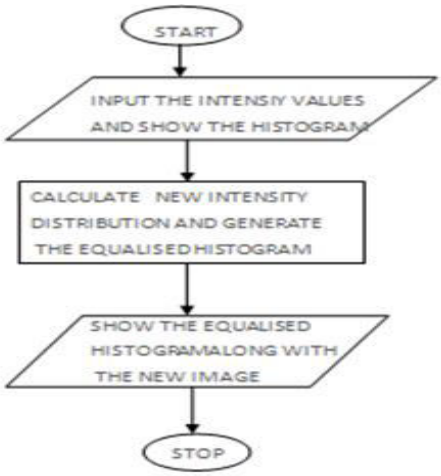
- Blur the original image
- Subtract the blurred image from the original image
- Add this difference to the original

Adaptive Histogram Equalization: Algorithm:

- Check window size
- Pad image
- For each pixel
  - Create sub image
  - Build histogram
    - For each pixel in sub image, increment appropriate bin by 1
  - Build the cumulative distribution function using the total number of pixels
  - Get the new pixel value
- Return the new image

Global Histogram Equalization

Figure-12: Flowchart of Global Histogram Equalization



Sources: Author Compilation

Conversion from Colour Image to Gray scale Image

For each pixel, repeat the following steps:

Calculate Gray Scale Intensity as: $I \triangleq \frac{1}{3}(R+G+B)$

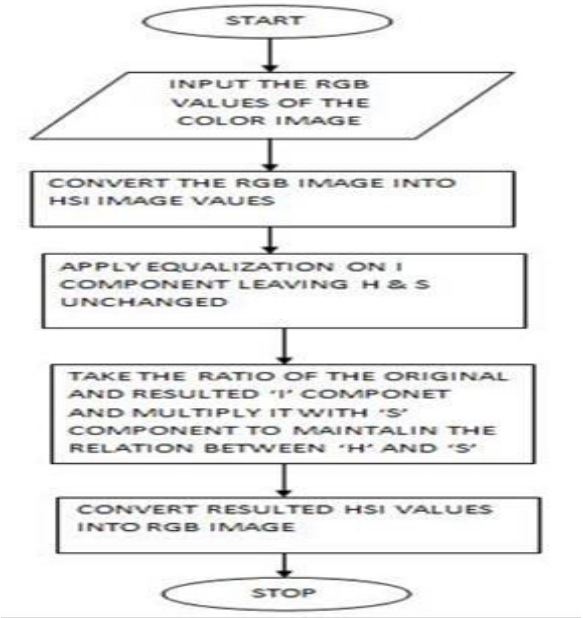
Assign the new intensity value to that pixel

Return the new Gray Scale Image.

Histogram Equalization of Color Image

For equalization of color images, we use the method whose flowchart is given below:

Figure-13: Histogram Equalization of Colour Image



Sources: Author Compilation

RESULT AND DISCUSSION

Evaluation and Contribution

As an evaluation and contribution from a study, we have tried to create application software named IMAGE ENHANCER. This software allows user to apply different enhancement techniques, any number of times in any sequence on a single image, so in this way user can get the images that suits to his/her purpose. User also has the facility to compare the results, which can help the user to get decision whether he/she is satisfying his/her requirements.

Following are the functions that will be performed:

- Global Histogram Equalization on user's choice of images.
- Local Histogram Equalization function on user choice of options.
- Smoothing using Median Filter on user's choice of images.
- Smoothing using Adaptive Noise Reduction Filter on user's choice of images.
- Sharpening using Unsharp filter.
- Conversion image to grayscale form color image.
- Conversion form grayscale image to binary image or colour image to binary image using Basic Global Thresholding.
- Provide option for applying all these methods only on a particular portion of the image.

SUMMARY AND CONCLUSIONS

Summary

The contents, which have been covered, are as:

- The Introduction is related to the background of Image Enhancer i.e. Digital Image Processing has been mentioned along with the objective of our investigation.
- The Review Literature is related to different Image Enhancement techniques, which are used to enhance a digital image.
- The Algorithm and Flow charts is related to different Algorithms, Flow chart required for enhancing a digital image by different techniques, and different methodologies adopted for investigation.
- The Result and Discussion is related to the Contribution from our study.

Conclusion

Various Image Enhancement Techniques can be used to enhance a digital image. We can perform various image operations like global histogram equalization, local histogram equalization, smoothing sharpening, binary conversion and gray scale conversion overall image as well as the sub area of the images as selected by the user.

The image quality of the image depends much on the user‘s current requirement. Therefore, he himself has to determine what operations or the combination of operations is required to fulfill the current need. In future, we can extend this research-based project by adding the investigation related to enhance a video, auto colorizing of gray images.

SCOPE OF FUTURE WORK

- We can extend this research-based project by adding the investigation related to enhance a video, auto colorizing of gray images.
- We can do the research in Bi-histogram equalization, dualistic sub-image, histogram equalization, scalable brightness preservation, recursive mean-separate.
- We can do research on mage Contrast Enhancement Based on a Histogram Transformation of Local Standard Deviation

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APPLICATIONS OF WEB MINING TO IMPROVE WEBSITE DESIGN PATTERNS

Yugal Joshi[5]

ABSTRACT

Most of the websites have a hierarchical organization of content. This organization may be quite different from the organization expected by visitors to the website and sometime it is unclear where a specific document is located. Many algorithms automatically search pages in a website whose location is different from where visitors expect to find them. In this paper, an algorithm is present for discovering such expected locations. Expected locations with a significant number of hits are then presented to the website administrator. We also present an algorithm for selecting expected locations (for adding navigation links) to optimize the benefit to the website or the visitor. Beside the structure of the website, users' preference to target pages is another key factor for analyzing the location or node importance. Clearly, a specific document which is visited frequently or where users stay for a long while indicates that it has a higher degree of preference. This paper introduces the duration's as a weight of the node to measure the preference.

KEYWORDS

Backtracking, Milestone Coefficient, Expected Location, Web Log Mining, Node etc.

INTRODUCTION

The evolution of the Internet has lead to an enormous propagation of the available information and the personalization of this information space has become a necessity. The knowledge obtained by learning web user's preferences can be used to improve the effectiveness of their web sites by adapting the web information structure to the users' requirement. Automatic knowledge extraction from web log files can be useful for identifying such reading patterns. However, it is hard to find appropriate tools for analyzing raw web log data to retrieve significant and useful information. Recently, the advantages of data mining techniques for discovering usage patterns from web data (i.e. web log mining or web usage mining) made it possible to mine typical user profiles from the vast amount of access logs. Web usage mining can be viewed as the extraction of usage patterns from access log data containing the behavior characteristics of users.

OPTIMIZING THE SET OF NAVIGATION LINKS

The proposed algorithm is used for finding user's pattern. Before applying this process on the weblogs, preprocessing on weblogs is required for removing the redundant data logs and other non-beneficial information for finding the required patterns. Therefore, the first preprocessing is done on weblogs.

A) Preprocessing Web Logs: Preprocessing is done by using the following steps:

Step 1: Data Cleaning

First step in Preprocessing is data cleaning which is used to remove the trashy entries. The following process is used to remove trashy entries:

Algorithm: Data Cleaning

```
For each transaction,
        If transaction T contain any ("404 (not found)","*.css","*.gif"," other trashy entries") Then
                Remove transaction T
        End If
End For
```

Step2: Relocate Data

After removing the trashy transactions this step is used to rearrange the data according to user IP addresses to form each user's request cluster.

Step3: Identifying Target Pages:

Next step is to identify target pages. If **t**here is a clear separation between content pages and index (or navigation) pages on website then web network topology is used to find out the target pages while if website not has a clear separation between content

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and index pages, we can use a time threshold to distinguish whether or not a page is a target page. Pages where the visitor spent more time than the threshold are considered as target pages. For identifying target pages we can also combine these two methods for websites with hybrid (structured + unstructured) structure.

Step4: Find Expected Location:

1. For each visitor, partition web log such that each subsequence terminates in a target page.

2. For each visitor and target page, find any expected locations for that target page:

Let $\{P_1, P_2, ..., P_n\}$ be the set of visited pages,
where P_n is a target page.
Let $B := \phi$ denote the list of backtrack pages.
a) for $i := 2$ to n-2 begin
b) if (($P_{i-1} = P_{i+1}$) or (no link from P_i to P_{i+1}))
c) Add P_i to B. // P_i is a backtrack point.
end
if (B not empty)
Add <P_n, B, P_{n-1}> to <current URL, backtrack list, Actual Location> table

B) Algorithm: Optimizing the set of Navigation Links

The proposed algorithm is used for finding the optimized set of navigation links. Below is the procedure for it:

Algorithm: Optimizing the set of Navigation Links

Let L be the list of set of pages recommended by the **Optimize Time** (explained later)
For each page p in L
Calculate **milestone coefficient M (p)**
(explained later)
End for
Sort list L according to milestone coefficient M

The page top in the list is milestone node (page) and the one most recommended. This would be the geographical and indication node of entire website with features of high connectivity to other pages and higher level of user preference.

Optimize Time

This algorithm recommends the set of pages that minimize the number of times the visitor has to backtrack, i.e., the number of times the visitor does not find the page in an expected location. The following process is used for this:

Algorithm: Optimize Time

Repeat
For each record begin
Let m be the number of expected locations in this record.
For $j := 1$ to m
Increment support of value (CE_j) by $m+1-j$.
end
Sort pages by support.
P: = Page with highest support (break ties at random).
If (support (P) >= S_t) begin
Add <P, support (P)> to list of recommended pages.
For each record begin
For k: = 1 to n begins
If value (CE_k) = P
Set CE_k, CE_{k+1}, ..., CE_n to null;
End
End

Milestone Coefficient

Milestone node is the geographical and indication node of entire website with features of high connectivity to other pages and high level of user preference. Milestone coefficient, defines the importance of the nodes, expressed as:

$$\mathbf{M=R_c * W_c + R_d * Wd + R_{t(k)} * Wt}$$

Where, W_c stands for connectivity weight, W_d stands for depth weight and Wt stands for preference weight and $W_c + W_d + Wt = 1$; and $\mathbf{R_c}$, $\mathbf{R_d}$, $\mathbf{R_{t(k)}}$ is Relative connectivity, Relative depth, and Node preference respectively. These parameters require information related to the website structure.

Create Website Structure

This is an important step, which create the hierarchal (tree) structure of the website so that connectivity of each node can be calculated.

Relative Connectivity

The in-degree of a node is the number of nodes coming to node in question while the out-degree of a node is the number of nodes coming from node in question.

So the connectivity of a node will be represented by:

C=I (in-degree) +O (out-degree) and
Relative connectivity is calculated as
Rc = C/Tc

Where, Tc is the sum of connectivity of all nodes in a website,
Relative connectivity of the node is calculated for finding the relation among the nodes.

Relative Depth

Once we have the tree structure of the website, depth level D can be easily calculated. Nodes at higher level are usually navigational pages with links to lower level nodes, which usually consist of content or service information. Therefore, the **relative depth**, which can also be used to measure the importance of a node, is measured as: Rd=1/D

Node Preference

User preference is an important factor for analyzing of requirement. Degree of preference of a node, in terms of time duration, is measured as T=Tj-Tj-1

Node preference is expressed as: Rt = T/Ta

Where T is visited duration of this node and Ta is the sum of all nodes visited duration.

CONCLUSIONS

The proposed algorithm works for both structured and unstructured website because timestamp is also taken into account to identify the content pages. The goal of optimize time algorithm is to minimize the number of backtracks the visitor has to make. While milestone coefficient defines the importance of a node according to website structure and used preferences in the above expression. So the proposed algorithm is used to find out the node(s) with highest importance that should be located at a relatively prominent position, which can be used as reference coordinates by browsers.

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BLUE BRAIN: ANALYTIC STUDY

Rupali I. Muttha[6] Amit A. Mokashi[7]

ABSTRACT

The Blue Brain Project (BBR) is the first project of its kind where the brain is going to be simulated on the computer so that some of the brain's functions and dysfunctions could be understood better. In 2005 IBM started new project that would recreate human brain by using IBM's Blue Gene supercomputer. At the end of the developing, it would be able to act like the brain. Blue Brain will provide a huge leap in our understanding of brain function and dysfunction and help us explore solutions to intractable problems in mental health and neurological disease. Detailed biologically accurate brain simulations offer the opportunity to answer some fundamental questions about the brain that cannot be addressed with any current experimental or theoretical approaches, These include: Completing a puzzle, Understanding complexity, Exploring the role of dendrites, Revealing functional diversity, Understanding memory storage and retrieval, Tracking the emergence of intelligence, Simulating disease and developing treatments, Providing a circuit design platform.

KEYWORDS

Blue Brain, Super Computer, Brain Simulation etc.

INTRODUCTION

Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning.

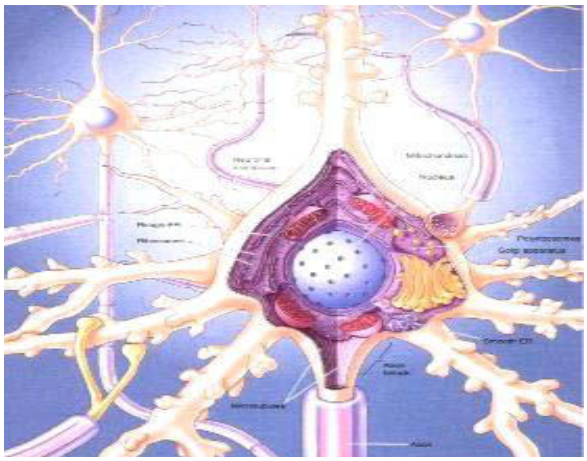
-Albert Einstein

IBM and Swiss researchers have recently joined forces on a project, dubbed the 'Blue Brain Project', to uncover the secrets of cognitive intelligence. On June 6, 2005, IBM and Ecole Polytechnique Fédérale de Lausanne in Switzerland (EPFL) announced a major joint research initiative nicknamed the Blue Brain Project – to take brain research to a new level, and is based on 15 years of experimental data obtained from reverse engineering the micro circuitry of the neocortical column. The Blue Brain project, (a joint venture of the Brain Mind Institute, EPFL, Switzerland and IBM, USA) has the eventual aim of applying terrific computer power to the simulation of an entire brain. It is not going to happen overnight, but it is going to happen. As far as they concern, all they plan to do is simulate one of the columnar structures in the cortex. That is a tiny fraction of a whole brain. That is the initial stage. It is a significant step forward in itself, but the ultimate aim is a total brain simulation.

Details

The aim is to study the brain's architectural and functional principles. The project was founded by Henry Markram who is Director of the Blue Brain Project, Director of the Centre for Neuroscience & Technology. Our understanding of the brain is limited by insufficient information and complexity in structure of brain. Over the next two years scientists from both organizations will work together to create a detailed model of the circuitry in the neocortex -the largest and perhaps the most complex part of the human brain.

Figure-1: Biological Structure of Neuron[1]



Sources: Author Compilation

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Blue Brain will search for:

- New insights into how human beings think and remember,
- How specific defects in our circuitry may contribute to autism, schizophrenia and Parkinson's. In the basement of a university in Lausanne, Switzerland sit four black boxes, each about the size of a refrigerator, and filled with 2,000 IBM microchips stacked in repeating rows. Together they form the processing core of a machine that can handle 22.8 trillion operations per second. It contains no moving parts and is silent. When the computer is turned on, the only thing you can hear is the continuous sign of the massive air conditioner. This is Blue Brain.

With Blue Brain, research that used to require several years of lab work can be done in a matter of days or minutes – using Blue Gene. The name of the supercomputer is literal: Each of its microchips has been programmed to act just like a real neuron in a real brain. The behaviour of the computer replicates, with shocking precision, the cellular events unfolding inside a mind. "This is the first model of the brain that has been built from the bottom-up," says Henry Markram, the director of the Blue Brain project. "There are lots of models out there, but this is the only one that is totally biologically accurate. We began with the most basic facts about the brain and just worked from there."

"The column has been built and it runs," Markram says. "Now we just have to scale it up." Blue Brain scientists are confident that, at some point in the next few years, they will be able to start simulating an entire brain. "If we build this brain right, it will do everything," Markram says.

The other thing is, whose brain are they going to be simulating? There are many detailed differences between the way one person's brain is wired, and another's. Now it is quite likely that some of the properties of that pattern of wiring are essential to consciousness, while others are just individual variation.

The first objective of the Blue Brain is to create a cellular level, software replica of the Neocortical Column for real-time simulations. Blue Brain will search for new insights into how human beings think and remember. How specific defects in our circuitry may contribute to autism, schizophrenia and Parkinson's.

"Modeling the brain at the cellular level is a massive undertaking because of the hundreds of thousands of parameters that need to be taken into account". "IBM has unparalleled experience in biological simulations and the most advanced supercomputing technology in the world. With their combined resources and expertise they are embarking on one of the most ambitious research initiatives ever undertaken in the field of neuroscience."

Using the digital model scientists will run computer-based simulations of the brain at the molecular level, shedding light on internal processes such as thought, perception and memory. Scientists also hope to understand more about how and why certain microcircuits in the brain malfunction - thought to be the cause of psychiatric disorders such as autism, schizophrenia and depression.

Step By Step

Between 1995 and 2005, Markram mapped the types of neurons and their connections in such a column. At the end of 2006, the Blue Brain project had created a model of the basic functional unit of the brain, the neocortical column. At the push of a button, the model could reconstruct biologically accurate neurons based on detailed experimental data, and automatically connect them in a biological manner, a task that involves positioning around 30 million synapses in precise 3D locations. In November 2007, the Blue Brain project reached an important milestone and the conclusion of its first Phase, with the announcement of an entirely new data-driven process for creating, validating, and researching the neocortical column.

In November 2007, project reported first phase end with deliverable of data-driven process for creating, validating, and researching the neocortical column. Now that the column is finished, the project is pursuing two separate goals:

- Construction of a simulation on the molecular level, which is desirable since it allow studying effects of gene expression, or simply expression, is the process by which a gene's DNA sequence is converted into the structures.
- Simplification of the column simulation to allow for parallel simulation of large numbers of connected columns, with the ultimate goal of simulating a whole neocortex (which in humans consists of about 1 million cortical columns.)

The project uses a Blue Gene .Blue Gene is a computer architecture project designed to produce several next-generation supercomputers, designed to reach applications.

Working

Blue Brain has some 8,000 processors, and by mapping one or two simulated brain neurons to each processor, the computer will become a silicon replica of 10,000 neurons.

The cerebral cortex, the convoluted "grey matter" that makes up 80% of the human brain, is responsible for our ability to remember, think, reflect, empathize, communicate, adapt to new situations and plan for future. The cortex first appeared in mammals, and it has a fundamentally simple repetitive structure that is the same across all mammalian species.

Blue Brain research phases software replica of a column of the neocortex:

– 85% of brains total mass,

– Required for language, learning, memory and complex thought:
  – The essential first step to simulating the whole brain.
  – Provides the link between genetic, molecular and cognitive levels of brain function.

RECONSTRUCTING NEOCORTICAL COLUMN

The images show the neocortical column (NCC) microcircuit in various stages of reconstruction. Only a small fraction of reconstructed, three dimensional neurons is shown. Red indicates the dendrite and blue the axonal arborizations. The columnar structure (green) illustrates the layer definition of the NCC:

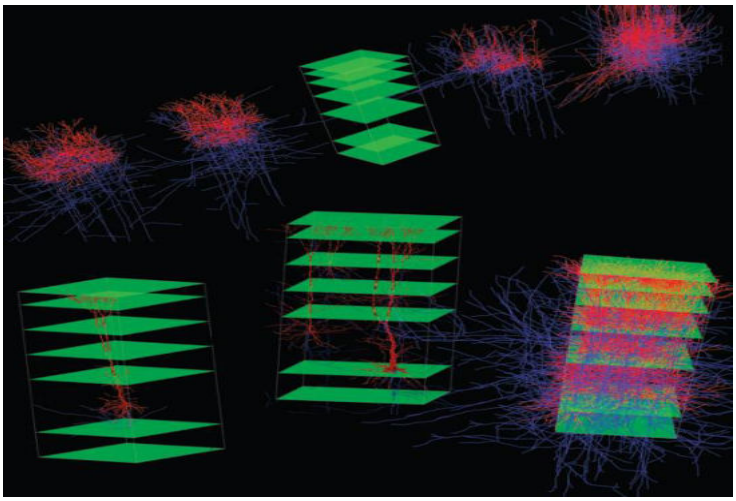
a) The microcircuits (from left to right) for layers 2, 3, 4 and 5.

b) A single thick tufted layer 5 pyramidal neuron located within the column.

c) One pyramidal neuron in layer 2, a small pyramidal neuron in layer 5 and the large thick tufted pyramidal neuron in layer 5.

d) An image of the NCC, with neurons located in layers 2 to 5.

Figure-2: Electrical neocortical column[2]



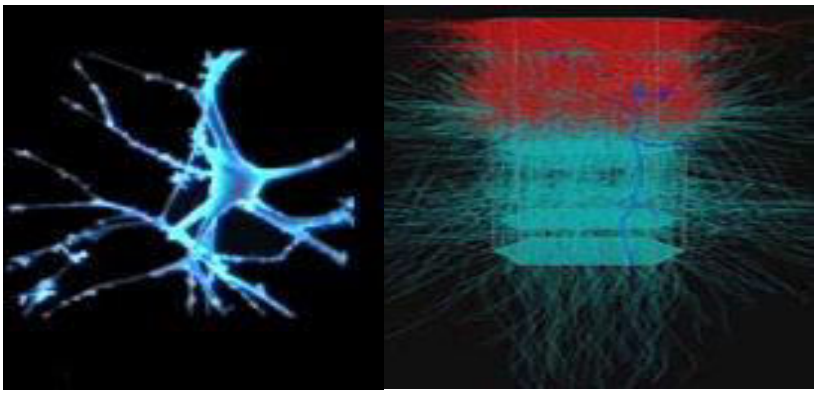
Sources: Author Compilation

Subsequent phases will be to expand the simulation to include circuitry from other brain regions and eventually the whole brain. This structure lends itself to a systematic modeling approach. In addition, indeed, the first step of the Blue Brain project is to re-create this fundamental microcircuit, down to the level of biologically accurate individual neurons. The microcircuit can then be used in simulations.

The brain is populated with billions of neurons, each connected to thousands of its neighbours by dendrites and axons, a kind of biological "wiring". The brain processes information by sending electrical signals from neuron to neuron along these wires. In the cortex, neurons are organized into basic functional units, cylindrical volumes 0.5 mm wide by 2 mm high, each containing about 10,000 neurons that are connected in an intricate but consistent way. The neocortex is a part of the brain of mammals (the part of the brain thought to be responsible for higher functions such as conscious thought). Neuron units operate much like microcircuits in a computer. This microcircuit, known as the neocortical column (NCC), is repeated millions of times across the cortex. The difference between the brain of a mouse and the brain of a human is just volume - humans have many more neocortical columns and thus neurons than mice. In animals, the brain, or encephalon, is the control centre of the central nervous system. Therefore, they decided to work out this project into five different levels i.e. they work with: a) Mice, b) Rat, c) Cat, d) Primate, and e) Human.

The goal of Phase was to build a cellular-level model of the somatosensory neocortex of a 2-week-old rat, corresponding to the dimensions of a neocortical column. The Blue Brain Project has achieved this goal by developing an entirely new data-driven process for creating, validating and researching the neocortical column. On November 26, an international group of journalists was invited to campus for the official conclusion of Phase I. Professor Giorgio Margaritondo, Daniel Rüthemann from IBM, and Henry Markram shared their visions - what the Blue Brain Project brings to EPFL, to IBM and to the future of neuroscience. In the afternoon, the journalists visited Markram's Laboratory of neural micro circuitry and held one-on-one interviews with Markram, Project Manager Felix Schürmann, and Sean Hill, IBM Project manager for computational neuroscience. Here is a selection of some of the extraordinary images they prepared for the press.

Figure-3: Simulation of Human Neuron[3]



Sources: Authors Compilation

With simulations on Blue Brain, he predicts, "we'll be able to do that same work in days, may be seconds. It's going to be absolutely phenomenal". This structure lends itself to a systematic modelling approach. One of the favourite tropes of both science fiction and extortion speculations about the future is the idea of uploading human consciousness into a computer. Uploading will require two things:

- An appropriate storage medium for holding not only the data that a brain contains, but the metadata that defines relationships between the data, as well as the "application logic" that knows what to do with this data and the "operating system" on which the whole thing runs.

- Sufficiently robust processing power to emulate the hardware functions of the brain. At the very least, it will provide an outstanding source of information on how the brain actually works at a fundamental level, and our first real tool for deconstructing it, and permanently integrating brain-machine interfaces in.

Applications

A few benefits of the Blue Brain Project are:

Gathering and Testing 100 Years of Data

The immediate benefit is to provide a working model into which the past 100 years knowledge about the microstructure and workings of the neocortical column can be gathered and tested. The Blue Column will therefore also produce a virtual library to explore in 3D the micro architecture of the neocortex and access all key research relating to its structure and function.

Cracking the Neural Code

The Neural Code refers to how the brain builds objects using electrical patterns. In the same way that the neuron is the elementary cell for computing in the brain, the NCC is the elementary network for computing in the neocortex. Creating an accurate replica of the NCC, which faithfully reproduces the emergent electrical dynamics of the real microcircuit, is an absolute requirement to revealing how the neocortex processes, stores and retrieves information.

A Novel Tool for Drug Discovery for Brain Disorders

Understanding the functions of different elements and pathways of the NCC will provide a concrete foundation to explore the cellular and synaptic bases of a wide spectrum of neurological and psychiatric diseases. The impact of receptor, ion channel, cellular and synaptic deficits could be tested in simulations and the optimal experimental tests can be determined.

A Foundation for Whole Brain Simulations

With current and envisage able future computer technology it seems unlikely that a mammalian brain can be simulated with full cellular and synaptic complexity (above the molecular level). An accurate replica of an NCC is therefore required in order to generate reduced models that retain critical functions and computational capabilities, which can be duplicated and interconnected to form neocortical brain regions. Knowledge of the NCC architecture can be transferred to facilitate reconstruction of sub cortical brain regions.

Parkinson's Disease

Parkinson's disease is another target. There is a group of cells deep down in the mid-brain that produces dopamine, and when these cells begin to die and dopamine production decreases, you get Parkinson's. They may be able to mimic this," creating simulations that should make Blue Brain an invaluable tool for drug-company researchers on the track of treatments or cures for Parkinson's.

Blue Brain promises a fantastic acceleration in brain research. It could be as dramatic as the leap from chiseling numbers in Sumerian clay tablets 2,500 years ago to crunching them in modern computers. In addition, the Blue Brain Project just might culminate in a new breed of super smart computers that will make even Blue Gene seem like a piker.

Completing a Puzzle

Experiments can obtain and view only small parts of the structure and function of the puzzle at any one time. Assembling the pieces of the neocortical column according to the blue print could reveal the overall picture.

Understanding Complexity

At present, detailed, accurate brain simulations are the only approach that could allow us to explain why the brain needs to use many different ion channels, neurons and synapses, a spectrum of receptors, and complex dendrite and axonal arborisation, rather than the simplified, uniform types found in many models.

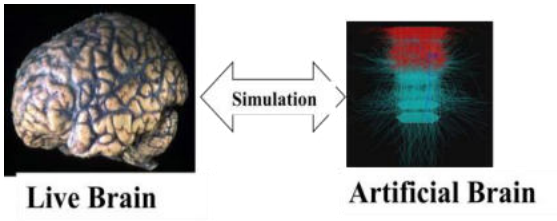
Analysis

After the study and analysis of all the available information about Blue Brain we can make certain assumptions that would give rise to new applications of the Blue Brain like:

Simulation of a Brain of a Particular Person

In this application we can simulate the brain of any particular person which can useful for next hundred's of generation of Mankind. E.g. The brain simulation of any scientist or great politician etc. It will helpful in many aspects for getting the appropriate answer for no. of question. If this concept we implemented hundreds of years earlier ,then now we have the simulated brain of Newton, Einstein, Hitler n many more.

Figure-4: Simulation of Brain of Particular Person

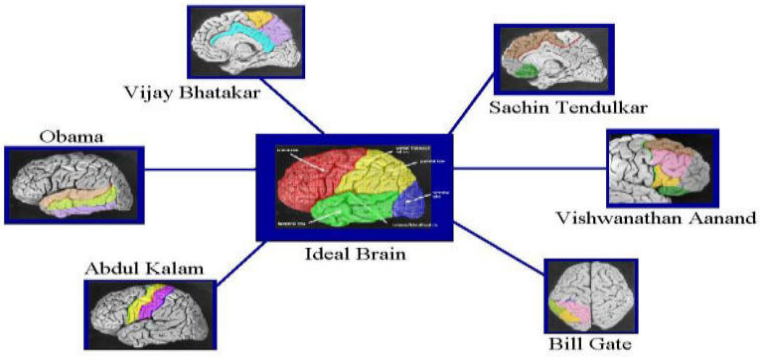


Sources: Authors Compilation

Framing an ideal brain for multiuse applications:

If this application may come in use earlier, it is very useful to solve the many of the problems that are faced by us in day today life. This concept is the extension of previous discussed application. Biologically it is proved that the human brain is divided in different partitions and each part is responsible for specific ability e.g. mathematical ability, reasoning capability, decision making etc. We simulate that respective part with the brain of a person who is superior in that field like Sachin Tendulkar is master of cricket or Bill Gates is famous for their business management and so on.

Figure-5: Concept of Ideal Brain[5]



Sources: Authors Compilation

CONCLUSIONS

- The synthesis era in neuroscience started with the launch of Human Brain Project and is an inevitable phase triggered by a critical amount of fundamental data.
- Data set is essential to guide reductionism research into the deeper facets of brain structure and function.
- Detailed models will probably become the final form of databases that are used to organize all knowledge of the brain and allow hypothesis testing, rapid diagnoses of brain malfunction, as well as development of treatments for neurological disorders.
- We can hope to learn a great deal about brain function and dysfunction from accurate models of the brain.

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13. ***Concept put forth first in present paper.***
14. ***Concept put forth first in present paper***.

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TRENDS AND PERSPECTIVES IN MOBILE CLOUD COMPUTING

Babita Chopra[8] Vivek Bhambri[9] Balram Krishan[10]

ABSTRACT

Cloud computing is an emerging concept combining many fields of computing. The foundation of cloud computing lies in the delivery of services, software and processing capacity over the internet, by reducing cost, increasing storage, automating system processes, decoupling of service delivery from underlying technology, and providing flexibility and mobility of information. Mobile Cloud computing is a new area, which combines the features of mobile computing and cloud computing. The convergence of cloud computing in mobile platforms has invoked a new wave of evolution in the rapidly developing mobile world. Although these two areas have been developed vastly when viewed as separate entities, but the field of cloud computing for mobile world is still unexplored. This technology is still at its infancy but is developing at a very fast rate. The objective of this paper is to present a review on the background and principle of MCC, its characteristics, features and infrastructure, recent trends and the challenges of being faced by mobile cloud computing.

KEYWORDS

Mobile Cloud Computing, Distributed Systems, Reliability, Heterogeneity etc.

INTRODUCTION

Cloud computing is the latest buzzword in the IT world now a days. Commonly, cloud computing is described as a range of services which are provided by an Internet-based cluster system. Such cluster systems consist of a group of low-cost servers or Personal Computers (PCs), organizing the various resources of the computers according to a certain management strategy, and offering safe, reliable, fast, convenient and transparent services such as data storage, accessing and computing to clients.

According to the top ten strategic technology trends for 2012[1] provided by Gartner (a famous global analytical and consulting company), cloud computing has been on the top of the list, which means cloud computing will have an increased impact on the enterprise and most organizations in 2012. On the other hand, smart phones are considered as the representative for the various mobile devices as they have been connected to the internet with the rapidly growing of wireless network technology. Ubiquity and mobility are two major features in the next generation network, which provides a range of personalized network services through numerous network terminals and modes of accessing. The core technology of cloud computing is centralizing computing, services, and specific applications as a utility to be sold like water, gas or electricity to users. As an inheritance and development of cloud computing, resources in mobile cloud computing networks are virtualized and assigned in a group of numerous distributed computers rather than in traditional local computers or servers, and are provided to mobile devices such as smartphones, portable terminal, and so on. Meanwhile, various applications based on mobile cloud computing have been developed and served to users, such as Google's Gmail, Maps and Navigation systems for Mobile, Voice Search, and some applications on an Android platform, MobileMe from Apple, Live Mesh from Microsoft, and MotoBlur from Motorola. [6]

Mobile devices allow users to run powerful applications that take advantage of the growing availability of built-in sensing and better data exchange capabilities of mobile devices. The mobile execution platform is being used for more and more tasks, e.g., for playing games; capturing, editing, annotating and uploading video; handling finances; managing personal health, micro payments, ticket purchase, interacting with ubiquitous computing infrastructures.

According to NIST[5] cloud computing is a model for enabling convenient, on-demand network access to computing resources that can be rapidly provisioned and released with minimal management effort.

The combination of cloud computing, wireless communication infrastructure, portable computing devices, location-based services, mobile web, etc., has laid the foundation for a novel computing model, called mobile cloud computing, which allows users an online access to unlimited computing power and storage space. Taking the cloud computing features in the mobile domain, mobile cloud computing can be defined as: "Mobile cloud computing is a model for transparent elastic augmentation of mobile device capabilities via ubiquitous wireless access to cloud storage and computing resources, with context-aware dynamic adjusting of offloading in respect to change in operating conditions, while preserving available sensing and interactivity capabilities of mobile devices."

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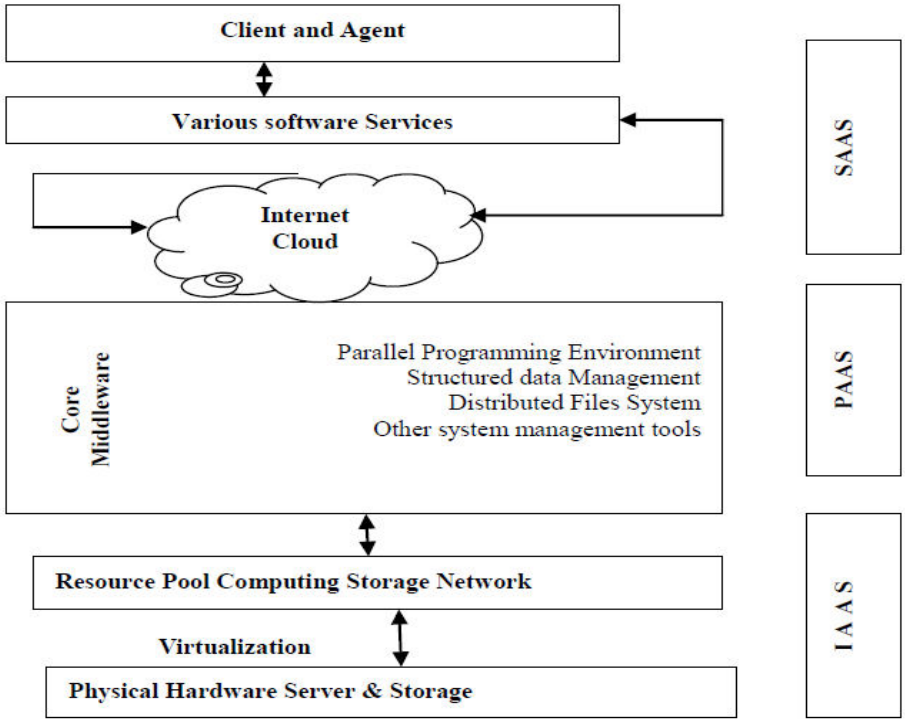
Figure-1: The Framework of Cloud Computing



Sources: Authors Compilation

REVIEW OF MOBILE AND CLOUD COMPUTING

Before going into the details of the novel concept of mobile cloud computing it is mandatory to study the basics of these two technologies:

Mobile Computing

Mobility is the success mantra in today's ever-changing global scenario. Every now and then, we come across a new mobile device with enhanced features and capability, because of which the whole universe is converging into a global village and distances between the resources, persons and geographically dispersed areas, is diminishing. The credit goes to the development of mobile devices such as, smart phone, PDA, GPS Navigation and laptops with a variety of mobile computing, networking and security technologies. Apart from this the development of wireless technology like WiMax, Ad Hoc Network and WIFI, users may be surfing the Internet much easier but not limited by the cables as before. Mobile computing is based on a collection of three major concepts: hardware, software and communication:

- Hardware is any mobile devices, such as smartphone and laptop, or their mobile components.
- Software of mobile computing is the numerous mobile applications in the devices, such as the mobile browser, anti-virus software and games.
- The communication issue includes the infrastructure of mobile networks, protocols and data delivery required and it is transparent to end users.

The major features of mobile computing are:

- It provides the facility to bring the heterogeneous, diversified and geographically apart networks to be connected. The networks connected may be wired network with high-bandwidth, or a wireless Wide Area Network with low - bandwidth, or even in status of disconnected.
- It provides the facility to be connected while moving through Mobile Support Station (MSS).

Cloud Computing

The urge of every human being to grow in terms of experience, the possessions he/she has and to have more power than before is prevailing all around the globe since the time immemorial. When it comes to having a computer system with the latest configuration today, the user buys it, but after a passage of 2 or 3 years, the user finds that the system he has is not up to marks or

is not in line with the latest configurations available in the market. He wants higher speed CPU, a larger capacity hard disk, and a higher performance Operation System (OS). However, every time it is not as easy to upgrade and enjoy the latest infrastructure due to the financial and resource constraints. Then the term called 'Cloud Computing' burst upon our lives. Cloud Computing has become a popular phrase since 2007. However, there is no consensual definition on what a Cloud Computing or Cloud Computing System is, due to dozens of developers and organizations described it from different perspectives.

C. Hewitt [2] introduces that the major function of a cloud computing system is storing data on the cloud servers, and uses of cache memory technology in the client to fetch the data. Those clients can be PCs, laptops, smart phones and so on.

R. Buyya[3] gives a definition from the perspective of marking that cloud computing is a parallel and distributed computing system, which is combined by a group of virtual machines with internal links. Such systems dynamically offer computing resources from service providers to customers according to their Service level Agreement (SLA).

The cloud computing system is the development of parallel processing, distributed and grid computing on the Internet, which provides various QoS guaranteed services such as hardware, infrastructure, platform, software and storage to different Internet applications and users. Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more united computing resources based on service-level agreements established through negotiation between the service provider and consumers [10].

The cloud computing systems actually can be considered as a collection of different services, thus the framework of cloud computing is divided into three layers, which are infrastructure layer, platform layer, and application layer[6] as shown in the Figure I given below:

- **Infrastructure Layer:** It comprises of the physical resources of the system, for computing and storage of data. It includes physical devices and hardware, such as servers and storages are virtualized as a resource pool to provide computing storage and network services users, in order to install operation system (OS) and operate software application. Thus it is denoted as Infrastructure as a Service (IaaS).

- **Platform Layer:** This layer is considered as a core layer in the cloud computing system, which includes the environment of parallel programming design, distributed storage and management system for structured mass data, distributed file system for mass data, and other system management tools for cloud computing. Program developers are the major clients of the platform layer. All platform resources such as program testing, running and maintaining are provided by the platform directly but not to end-users. Thus, this type of services in a platform layer is called Platform as a Service (PaaS).

- **Application Layer:** This layer provides some simple software and applications, as well as customer interfaces to end users. Thus we name this type of services in the application layer as Software as a Service (SaaS). Users use client software or a browser to call services from providers through the Internet, and pay costs according to the utility business model (like water or electricity). The earliest SaaS is the Customer Relationship Management (CRM) from Salesforce, which was developed based on the force.com (a PaaS in Sales force). Some other services provided by Google on-line office such as documents, spreadsheets, presentations are all SaaS.

The Features of Cloud Computing are as follows:

- The 'Cloud' can be considered as a virtual resource pool where all bottom layer hardware devices is virtualized. End users access desired resources through a browser and get data from cloud computing providers without maintaining their own data centers. In many cases virtual machines (VMs) are often installed in a server in order to improve, the efficiency to use resources; and the load of the server is balanced up to some extent [11].

- Cloud computing provides a safe mode to store user's data without worrying about the issues such as software updating, leak patching, virus attacks and data loss. If failure happens on a server the cloud computing systems transfer and backup those data to other machines, and then delete those failure nodes from the systems automatically in order to make sure the whole system has normal operation. So a cloud system provides the users the facility of r*eliability, usability and extensibility:*

- The cloud computing system normally consists of thousands of servers and PCs. This *Large-scale integration provides the facility of* supercomputing and mass storage.

MOBILE CLOUD COMPUTING

The hardware and software of mobile devices is improving at the blink of the eye, every now and then, we come across a new hardware having better capabilities than before and new software is providing the features, which the user has not even dreamt of. The advent and use of smart phones such as iPhone 4S, Android serials, Windows Mobile serials and Blackberry, are no longer

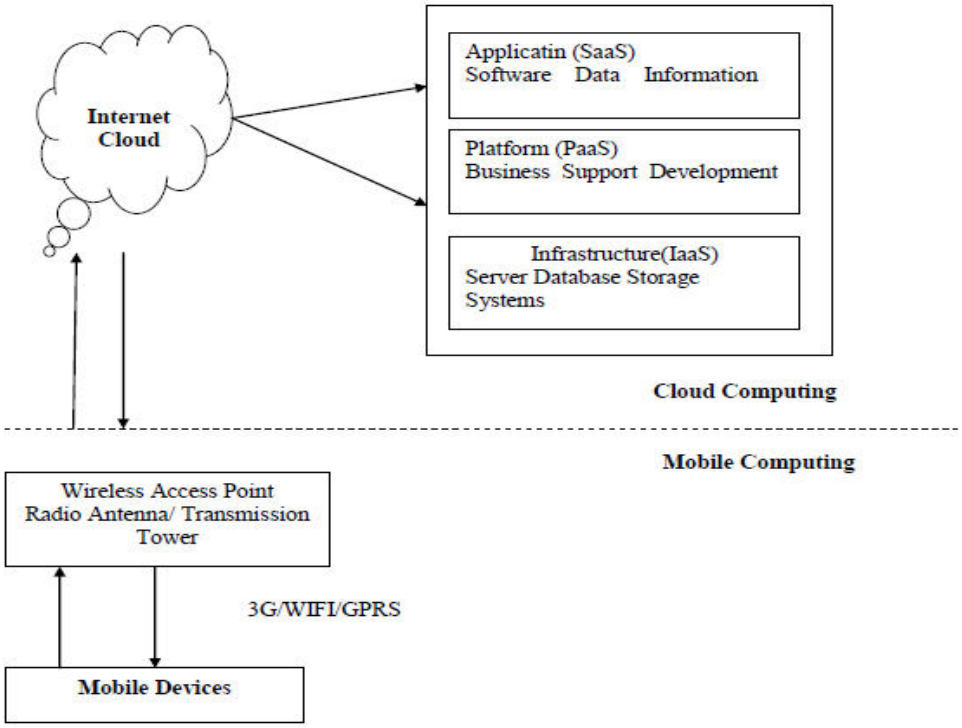
just used for conversation, SMS, Email or website browsing but these are also providing various facilities like navigation, optics, gravity, orientation, and many more advanced features.

Concept and Principle

Mobile computing is a generic new concept, which tries to combine the features of mobile, computing and cloud computing, which provide cloud based services to users through the Internet and mobile devices. On one hand, the mobile cloud computing is a development of mobile computing, and an extension to cloud computing. In mobile cloud computing, the previous mobile device-based intensive computing, data storage and mass information processing have been transferred to 'cloud' and thus the requirements of mobile devices in computing capability and resources have been reduced, so the developing, running, deploying and using mode of mobile applications have been totally changed. On the other hand, the terminals which people used to access and acquire cloud services are suitable for mobile devices like Smartphone, PDA, Tablet, and iPad but not restricted to fixed devices (such as PC), which reflects the advantages and original intention of cloud computing. Therefore, from both aspects of mobile computing and cloud computing, the mobile cloud computing is a combination of the two technologies, a development of distributed, grid and centralized algorithms, and have broad prospects for application.[9]

As shown is the Fig. II mobile cloud computing can be simply divided into cloud computing and mobile computing. Those mobile devices can be laptops, PDA, smart phones, and so on, which connects with a hotspot or base station by 3G, WIFI, or GPRS. As the computing and major data processing phases have been migrated to 'cloud', the capability requirement of mobile devices is limited, some low-cost mobile devices or even non-smart phones can also achieve mobile cloud computing by using a cross-platform mid-ware. Although the client in mobile cloud computing is changed from PCs or fixed machines to mobile devices, the main concept is still cloud computing. Mobile users send service requests to the cloud through a web browser or desktop application, then the management component of cloud allocates resources to the request to establish connection, while the monitoring and calculating functions of mobile cloud computing will be implemented to ensure the QoS until the connection is completed.[6]

Figure-2: Architecture of Mobile Cloud Computing



Sources: Authors Compilation

Benefits of Mobile Cloud Computing

Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing apps and mobile computing to not just Smartphone users but also a much broader range of mobile subscribers. The possible benefits of Mobile Cloud Computing are [6]

- Mobile Cloud Computing will help to overcome limitations of mobile devices in particular of the processing power and data storage.

- It also might help to extend the battery life by moving the execution of commutation-intensive application 'to the cloud'.
- Mobile Cloud Computing is also seen as a potential solution to integrate the fragmented market of mobile operating systems.

- Mobile Cloud Computing can increase security level for mobile devices achieved by a centralized monitoring and maintenance of software.

- It can also become a one-stop shopping option for users of mobile devices since Mobile Cloud Operators can simultaneously act as virtual network operators, provide e-payment services, and provide software, data storage, etc. as a service.

- A number of new technical functionalities might be provided by mobile clouds. In particular, provisioning of context- and location-awareness enables personalization of services is an attractive functionality.

- Mobile Cloud Computing might open the cloud computing business that is currently almost exclusively addressing businesses to consumers since they will significantly benefit from the above-described options.

Challenges in Mobile Computing

The main objective of mobile cloud computing is to provide a convenient and rapid method for users to access and receive data from the cloud, such convenient and rapid method means accessing cloud computing resources effectively by using mobile devices. The major challenge of mobile cloud computing are [7]

- The various mobile devices connected through the wireless networks have different designs and working characteristics, they all have their own restrictions and limitations, quality of wireless communication, types of applications used and support from cloud computing to mobile are all important factors which makes the application designing, programming and deploying on mobile and distributed devices more complicated than on the fixed cloud devices.

- In spite of the rapid growth in mobile technology and the devices, still these devices are not as efficient as compared to the fixed cloud systems. Although smart phones have been improved obviously in various aspects such as capability of CPU and memory, storage, size of screen, wireless communication, sensing technology, and operation systems, still have serious limitations. Limited computing capability and energy resource, to deploy complicated applications is another major hindrance in this area.

- The mobile devices used needs to be charged everyday as dialing calls, sending messages, surfing the Internet, community accessing, and other internet applications. *Mobile* signals are susceptible to interference and snooping, a mobile computing network system has to be designed keeping in mind the various security issues in mind.

- Another major issue in mobile cloud computing is the quality of communication, in contrast with wired network uses physical connection to ensure bandwidth consistency, the data transfer rate in mobile cloud computing environment is constantly changing and the connection is discontinuous due to the existing clearance in network overlay.

- Mobile connections suffer from the problem of frequent disconnections and integration of diverse networks into one platform are the major difficulties in this area.

- Data centre in large enterprise and resource in Internet service provider normally is far away to end users, especially to mobile device users. In wireless network, the network latency delay may 200 ms in 'last mile' but only 50 ms in traditional wired network.

- Some other issues such as dynamic changing of application throughput, mobility of users, and even weather will lead to changes in bandwidth and network overlay.

- In mobile cloud computing environment, due to the issue of limited resources, some applications, which are compute-intensive or data-intensive, cannot be deployed in mobile devices, as they may consume massive energy resources. Therefore, the solution is to divide the core-computing task to the cloud, and mobile devices are responsible for some simple tasks only. However, while making it possible data processing in data centre and mobile device, network handover delay, and data delivery time should be kept in mind.

CONCLUSIONS

Mobile cloud computing (MCC), when visualized as an extension of mobile computing (MC) and cloud computing (CC), provides the facility of high mobility and scalability. The full potential of mobile cloud applications can only be achieved if computation and storage is offloaded into the cloud. The major points to ponder upon is how to abstract the complex heterogeneous underlying technology, how to synchronize the various parameters that influence the performance and interactivity of the application, how to achieve optimal performance under different constraints, how to integrate computation and storage limitations of mobile devices, quality of communication, and division of applications services. Upgrade bandwidth for faster wireless connection, provision to reduce data delivery time, duplication of mobile devices to cloud using virtualization and image technologies, dynamic optimize application push in cloud and the division with mobile terminals, optimal division of application between cloud and mobile device, interaction between low-latency and code offload, high-bandwidth between cloud and mobile device for high speed data transmission, user-oriented cloud application performance, self-adaptation mechanism of mobile cloud computing, and optimal consumption and overhead of mobile devices and cloud servers are some of the solutions which can be applied to enhance the performance of mobile computing systems.

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INFORMATION SYSTEM IN ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION: A STUDY

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ABSTRACT

The success of any organization depends upon the effectiveness with which the important functions of management are integrated and carried out with appropriate technologies and system. Efficient information system can contribute significantly towards the achievement of such organizational objectives. The Andhra Pradesh State Road Transport Corporation (APSRTC) is on important service organization and its effective and efficient functioning goes a long way in catering to the transportation needs of millions of people in Andhra Pradesh and in India.

The present study intends to examine the information system policies and practices in APSRTC, with open to highlight the inadequacies, lapses, if any, therein and provide constructive suggestions to rectify those problems to improving the overall managerial performance.

KEYWORDS

Mobile Cloud Computing, Information, System, Management Information System, APSRTC, State Road Transport Corporations, Computerization, Connectivity etc.

INTRODUCTION

The APSRTC was incorporated in 1958, as a state owned public transport undertaking to provide transportation services to the commuters with its headquarters at Hyderabad, Andhra Pradesh, India. In this year 1958-59, the corporation owned 16 depot and one regional workshop at Hyderabad. It has then 679 buses, 5081 employees, and 133 routes with a total routes distance of 6171 kilometer with a capital investment of Rs.294 lacks. As a dynamic and progressive organization, the APSRTC has been making rapid strives over the year. At present, the corporation coved over 66.71 lakhs Kms by operation 19377 buses, with a total employees of 116131 as on 2010 statistics. It all its huge fleet operations, the APSRTC have the place in the Gunnies World Book. It is true that such a great organization should require the help of the information system and its applications.

The field of information system and MIS is undergone a profound and explosive revolution. The changes in information technology and upsetting the basic assumption that have served information system well over many a decades. According to the Robert G. Murdrock, "the information system is a system that monitors and retrieves data from the environment, capture data form transaction and opinions within the firm, filters, organizes, and select data and present those as information to managers, and provides the means for managers to generate information as desired (Robert G Murdock &John C Munsion-1998). This, the information system also provides a system of information which aids management in solving problems and in making decisions even in APSRTC.

REVIEW OF LITERATURE

There are no systematic studies on information system in State Road Transport Corporations. However, there are a few small studies on reporting system in public enterprises. Some of such studies are briefly outlined in the following lines.

J. Satya Narayana (1985) analyzed the MIS policies and practices in APSRTC and pointed out that there is no precise demarcation of MIS work at different levels of decision-making. Rakesh Chandra Sharma (1979) felt that irrespective of sector differences the report practices in public enterprises were not satisfactory. S.K. Mathus (1985) felt that the present MIS practices in the state road transport undertakings are not effective for monitoring the performance. K. Rajeswar Rao and M. Subrahmanya Sharma (1985), found that MIS policy in public enterprises has not been effective enough from the point of view of decision-making and control.

Mr. M. Subranmanyam Sharma (1992) examined the MIS policies, practices in selected state enterprises, with a view to highlight the inadequacies, and lapses in those organizations. He also emphases the integrated information system which can contributes significantly towards the achievements of organizational goals. C. S. Venkata Aathnam and K. Ramanaidu (1983), study observed that a well-defined organization structure is basic prerequisite of an effective management information system.

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Several other studies also the committees on public undertaking pointed out the MIS in state enterprises has not been effective and sufficient enough from the point of view of decision-making and information reporting.

OBJECTIVES OF STUDY

The present study carries the following objective: To review and study the information system in APSRTC.

RESEARCH METHODOLOGY

To study the present information system in selected organization a systematic methodology needs to be adopted. Accordingly, the following methodology has been evolved.

Database
Both primary and secondary data source re used. Mostly the secondary sources like forms and documents, records manuals and rules books, which specifically how various activities are, carried out in the organization, and various reports generated and used in the organization.

Data Collection Methods
The required data has collected by on-site observations and instructed interviews.

System Analysis
System analysis refers to decomposition of the system and sub-systems to have a through idea about how the total system functions. The necessary CSF (critical success factors) is also formed to analysis.

Information System and Technology in APSRTC

The APSRTC is one of the most information system and technology conscious organizations in the state of Andhra Pradesh. IT absorption, adoption, and innovation have been the prime movers of the scientific and technological pursuits undertaken by the APSRTC. Implementation of innovative process expertise, developmental insight, engineering and re-engineering processes have resulted in increasing overall productivity, quality, and commuter's satisfaction.

The APSRTC is distinct in the bus body designing with CAD, besides the corporation has successfully implemented MIS data Monitoring Software for the development of its communication system. The APSRTC even got the credit of introducing the computerized vehicle testing machines (CVTM). Some of the recent measures under taken by the APSRTC in terms of Information System: these are:

1. **Operations System**

   Operations are the most difficult and important functional areas in APSRTC. In operational function, the IT based system is adopted to execute the corporation's activities. In order to handle the operational functions effectively, the corporations has implemented ULTAS (Online Ticket Accounting System), ACTIS (Advanced and Current Ticket Information system), and GIS (Geographical Information System)

2. **Maintenance Systems**

   Maintenance management function in APSRTC is yet another important are. It is also called preventive maintenance management function. In order to detect the problems repairs in advance, the effective utilization and advanced IT has been put to implementation. These are VMS (Vehicle Maintaining System, and VTS (Vehicle testing Systems)

3. **Inventory Management System**

   Right goods at right time procurement is another responsible function of any organization and in APSRTC particularly, this applies to oil consumption and tyre utilization. To executive this function effectively, the corporation has developed information system application like STOINS (stores inventory system), and OTMS (Online Inventory Management System).

4. **Accounting System**

   Accounting function is one of the major sub-systems and the lifeblood of an organization. It is some time very difficult to handle perfect and full-proof accounting system. The APSRTC adopted the advanced IT based applications in field of accounting and helps the managers to run-out the required job successfully. The applications developed and implemented by the APSRTC in the field of accounting are PRS (Payroll system), PFAS (Provident Fund Accounting System), and FAIS (Financial Accounting information systems).

5. **Medical Assistance and Welfare Systems**

   The APSRTC has also implemented the information system application in HR areas like SRBS, SBT, CCS, SSS, and OHMS. All these applications are very useful o perform the various welfare activities effectively and efficiently by the organization.

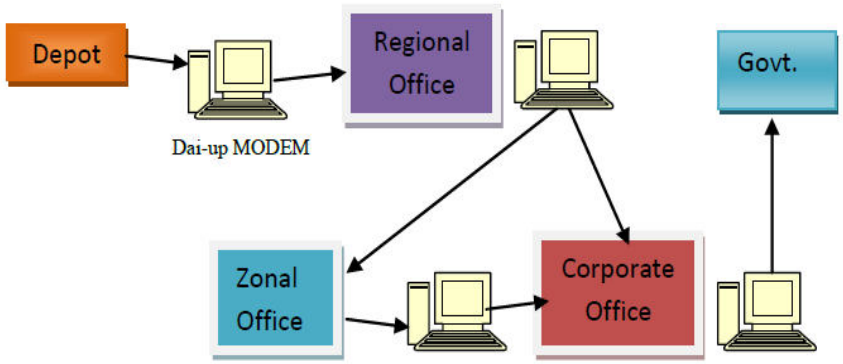
6. **Communication System**

   Most important function of any organization where the APSRTC also very strong in the usage of communication system and its applications in adherent forms.

COMPUTERIZATION AND CONNECTIVITY

All the computerized APSRTC Depots are connected to their respective regional officer through dial-up MODEMS. In turn, all the regional officers are connected to their respective zonal and corporate offices through dial-up MODEMS. Corporate office will look after the transaction of the same data thorough dial-up network to the government. Figure1 shows the connectivity procedures.

Figure-1: Computerization and Connectivity



Sources: Authors Compilation

The whole system has been using the following platforms. That is, UNIX system, Networks systems, DOS/ Windows, CAS systems, along with these platforms, the APSRTC also uses various software programs like COBOL, FOXBASE, FOX PRO, C and ORACLE.

CONCLUSIONS

The APSRTC is one of the state owned enterprises that have been adopting the information system in their organizational system. The APSRTC is the oldest and he largest public transport corporation in the country providing commuting facilities coverage a large number of people, with unstinted service motto. At present, it is function with 19337 vehicles and 11631 employees in all.

The performance of APSRTC is satisfactory as compared with that of other state transport corporations in India. The MIS policies and procedures of the APSRTC are the matter of highlights in this regard. The corporation had been striving hatred towards progressive implementation of information technology and its related approaches to generate accurate information. The advent of computerization in the organization has speeded up the process of work. The corporation has propounded its plans towards the development of information technology applications in several of its activities. A sound and effective information system emanates from a well-planned and healthy organizational system. A systematically planned and flexible organization supports the information and vice-versa.

At present, the corporation generates 67 reports covering certain crucial decision-making areas. The reports provide useful information to the management at different levels of the organization. All these reports have been analyzed and whether it is necessary they are redesigned to suit to the need of the users.

The further study, one may go to analysis of the information system in APSRTC in terms of organizational structure, information reporting system, layout of reports, filling-up and accession of data, data consciousness and information effectives, user's attitude towards reporting, extent of analysis in reporting, and flow of information in between the decision-makers.

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PERCEPTION OF EMPLOYEES TOWARDS APPLICABILITY, EXTENT AND EFFECTIVENESS OF KNOWLEDGE MANAGEMENT IMPLEMENTATION

Gaurav Chandhiok[14] Shubham Vashishtha[15]

ABSTRACT

IT sector today is one of the fastest growing sectors in India. Knowledge management is an upcoming domain in the IT industry. The need for knowledge management is increasing due to the increased competition and it is becoming more and more important for organizations to manage the knowledge of their people. Today KM is a strategic part of all business and KM could be beneficial to the organization. The employees are more than willing to participate in the sharing of knowledge in the organization.

Organizations have started to recognize the importance of KM in their organizations. KM makes faster availability of information. The research is undertaken with the objective to understand the perception of employees towards KM and the extent to which the concept of KM is implemented in the organization. The research methodology used was exploratory research, non- probabilistic convenience sampling and snowball sampling was used for selecting the sample which consisted of 75 on-roll employees in IT organizations.

Data analysis tool used was SPSS 19. The research found that organizations with age less than 5years have attrition as the biggest reason for knowledge loss. From off the shelf KM tools available to the organizations Livelink and Webmeta engine, are the most preferred tools been used in the industry? Organizations prefer to use self-developed tools for knowledge integration. This trend points out that newer organizations or ventures have very well understood and accepted the usefulness and need for knowledge management for better efficiency. Usage of content management system is highest for organizations that have businesses in both the domains.

The research also helps identify the various types of KM methodologies that are being used in different type of organizations. Training is been used extensively by all types of organizations whereas exit interviews are given much importance in services based organizations.

KEYWORDS

Knowledge Management, Knowledge Transfer, Performance, Competitive Advantages etc.

INTRODUCTION

Knowledge management has been described in many different ways over the past few decades. Davenport (1994) "Knowledge management is the process of capturing, distributing, and effectively using knowledge." This could be understood as one of the most simple and easily understandable definition.

Few years later, another definition, which is one of the most quoted one, was given by Gartner Group (Duson, 1998) "Knowledge management is a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously un-captured expertise and experience in individual workers." We find both definitions have quite widely been applicable in understanding the concept of knowledge management.

Knowledge management has many benefits in various different dimensions. Knowledge management can help in improving financial performance, improving customer orientation, and increasing motivational level. Apart from this Knowledge management play an important role in cost reduction across operational areas whereas improvement in quality of decisions, improvement in level of cooperation are the other benefits of knowledge management which are the resultant of reinforcement of various operational areas like inter ad intra departmental communication across the organization.

Each employee in the organization has accumulated experience over the years and has unknowingly used it for solving problems or creating strategies. The major challenge lays in getting people to know 'what they know' and then share it with others, make it articulate and explicit.

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LITERATURE REVIEW

Nonaka I. & Takeuchi, H. (1995) tried to define knowledge as justified true belief. They have offered classification to two types of knowledge- explicit and tacit, hidden in the heads of people. The authors perceived knowledge as created and expanded through the interaction between explicit and tacit knowledge. Explicit knowledge is said to be encoded in formal organizational models, rules, documents, drawings and processes and is easily communicated externally. Explicit knowledge could be converted in to two forms. It could be converted either to tacit, when an individual reads and understands coded knowledge or to other type i.e. explicit knowledge through combination of one or more form of knowledge to generate new knowledge. Which could be converted to another tacit knowledge through socialization in face-to-face interactions or to explicit knowledge through externalization by codifying an individual's knowledge?

Alavi & Leidner, (2001) discussed about how IT enhances organizational KM capability through promoting employees' communication, participation in problem solving, decision making and other activities. They also pointed out that IT resources might have more effect on the management of explicit knowledge than on the management of tacit knowledge. Also while trying to balance the social and technical aspects of knowledge, the author have chosen processes that tend to interpret it as product: creation, storage and retrieval, transfer, and application.

Ioana Rus & Mikael Lindvall (2002) have explored the various motivational factors, needs, opportunities for knowledge management in the area of software engineering. They also pointed out the various benefits of KM that are attached in software development field. In addition, the various risks that could be prevented with the use of knowledge management. Author has also discussed the main pain points, which are responsible for vast implementation of knowledge management in software field.

Murray (2003) explained the Organizational Memory System (OMS) as the entity comprising of the processes and Information System (IS) components used to capture, store, search, retrieve, display, and manipulate Organizational Memory (OM). The Knowledge Management System (KMS) consisted of the tools and processes used by knowledge workers to identify and transmit knowledge to the knowledge base contained in the OM. Knowledge was managed and used through a combination of KMS and OMS.

Cindy Qin, Prem Ramburuth and Yue Wang (2008) studied the role of cultural distance on the relationship between knowledge transfer within MNCs and subsidiaries performance. The paper suggested that the transfer of knowledge is related positively to the performance of the subsidiary. The performance of the subsidiary was also been effected by the cultural framework, and aggregate knowledge transfer within firms.

R Krishnaveni & C S Senthil Raja (2009) analyzed the reliability and validity of two parameters—KM life cycle activities and knowledge benefits for the IT organizations. The impact of KM life cycle activities on the knowledge benefits of the firm was also tested and the KM life cycle activities were found to have positive impact on knowledge benefits of the IT organization. The author's study thus implied that for a knowledge organization to remain in competition, the organization must keep its KM life cycle activities up to date.

Jyoti Batra (2010) found the competitive advantage that the organizations get with the presence of knowledge management systems. With the development and sharing of knowledge innovative ability of employees increases. KM is the creation and application of new knowledge for achieving additional value. It is the continuous process of development and improvement. Paper also proposed the relationship effect between the utilization of information technology, social network and building of the KM process. In addition, the support from the employees of the organization towards the use of knowledge sharing among them has significant influence.

Mary Mathew & Devaraj Kumar (2011) have tried to measure the relationship between knowledge management initiatives in IT organizations and the level of innovativeness in the organization. KM initiatives measured in the paper were in context of structural, technological and cultural interventions. For measuring the innovation in relation to organizational behaviour, these parameters were taken: learning, sensitivity, newness, communicability, risk-readiness, and absorption.

RESEARCH METHODOLOGY

Objectives of Research

- To identify the effectiveness and extent of implementation of Knowledge management in IT organizations.
- To study the perception of employees towards effectiveness of Knowledge management in IT organizations.

Research Design

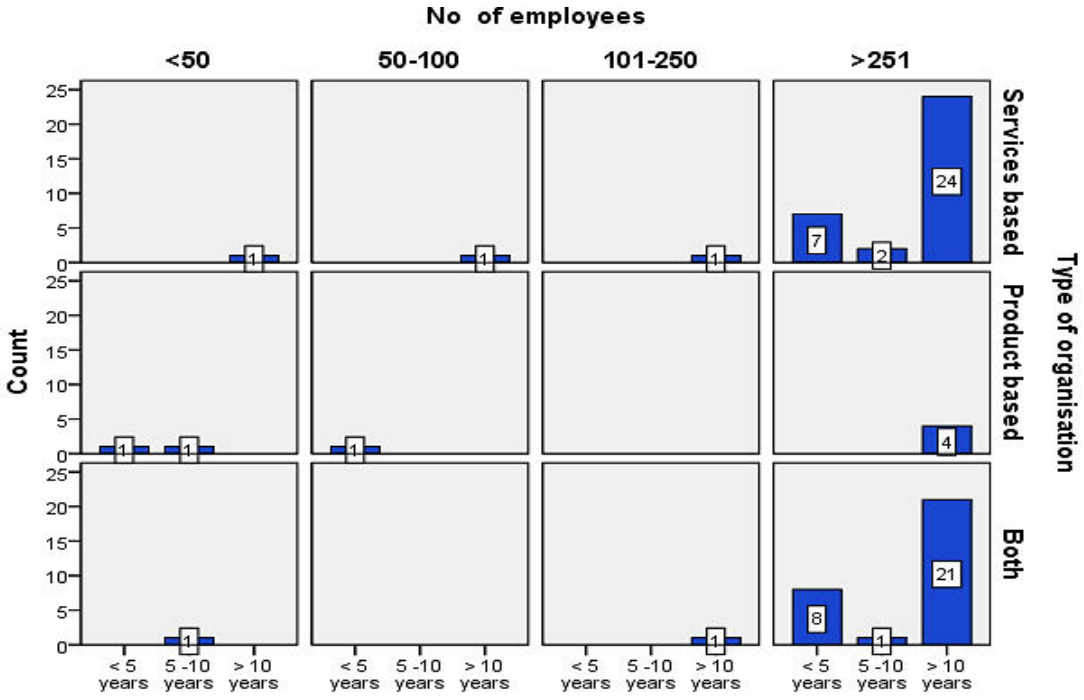
- Research Type : Exploratory
- Type of Data: Primary, Secondary

- Data Collection Tools:
    - Structured Questionnaire
    - Personal Interview/In depth Interview
    - Focus Group Interview
- Tools of Data Analysis
    - SPSS 19.0
    - Microsoft Excel
- Type of Survey: Sample Survey
- Definition of Sampling Frame : On-roll employees in IT organizations
- Sampling Size: 75
- Sampling Technique
    - Non-probability Convenience sampling
    - Snowball sampling
- Sample Survey Method: Personal Interviews and Web mail responses
- Testing Techniques: Chi-square Test

DATA ANALYSIS AND INTERPRETATION

Scope / Demographic Profiling

Graph-1: Demographic Profile



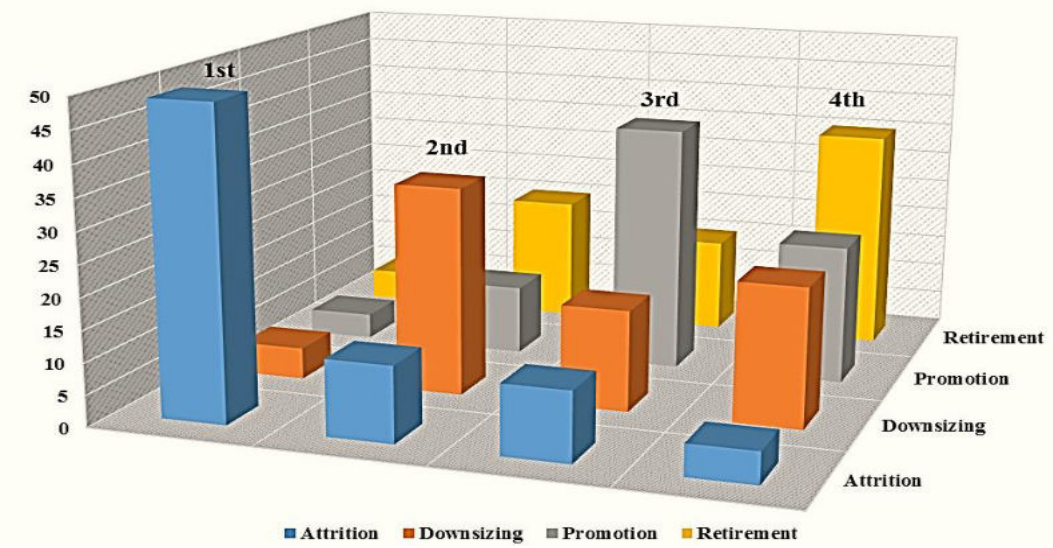
Sources: Authors Compilation

Interpretation

Out of 75 people, 36 people belonged to pure services organization, 7 belonged to product-based organization and 32 belonged to organization having businesses in both the areas.

Ranking of Factors for Loss of Knowledge

Graph-2



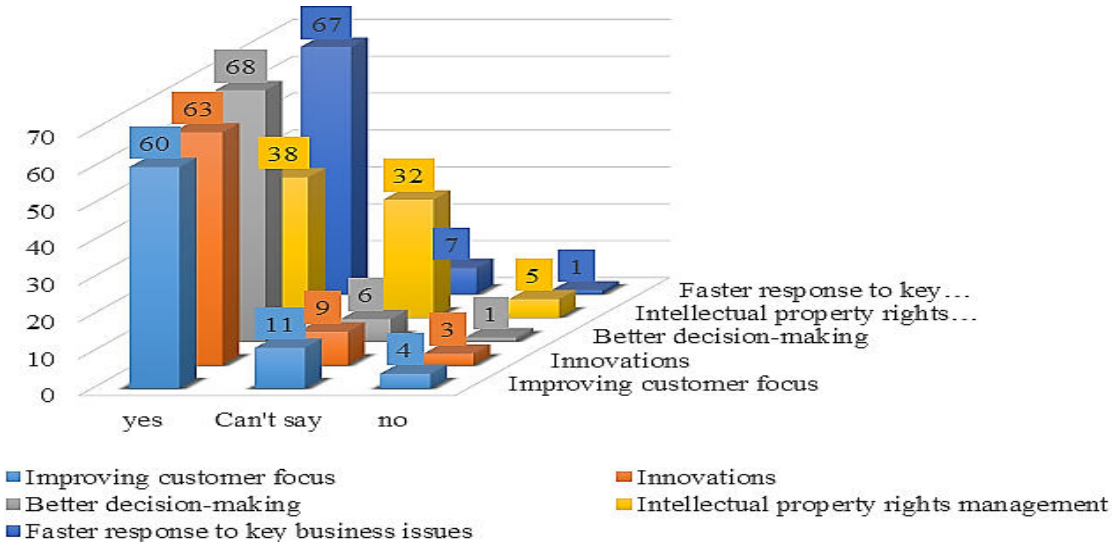
Sources: Authors Compilation

Interpretation

As per Figure 2, based on the responses, attrition of the employees is ranked as the most responsible factor for the loss of knowledge, followed by downsizing been the second most responsible, promotion been the third most important factor and retirement been the least important.

Role played by Effective KM System

Graph-3



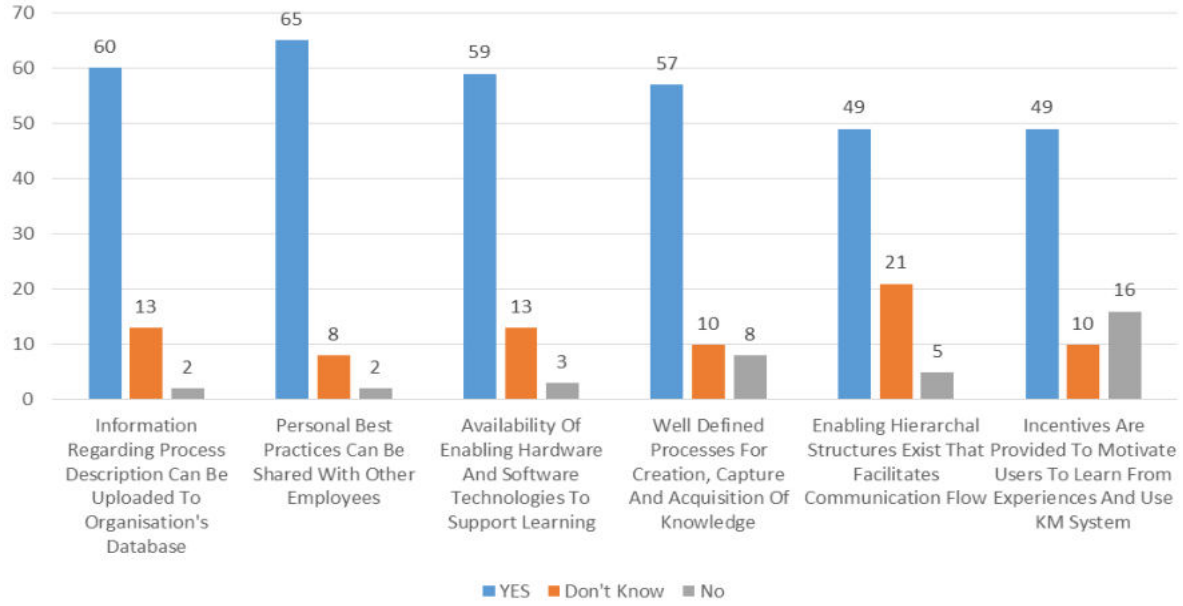
Sources: Authors Compilation

Interpretation

It has been found that effective KM systems play an important role in improving customer focus, innovations, better decision-making, intellectual property rights management, and faster response to key business issues. Though for intellectual property rights management the results show that respondents are not sure about whether it helps or not.

Extent of Knowledge Management

Graph-4



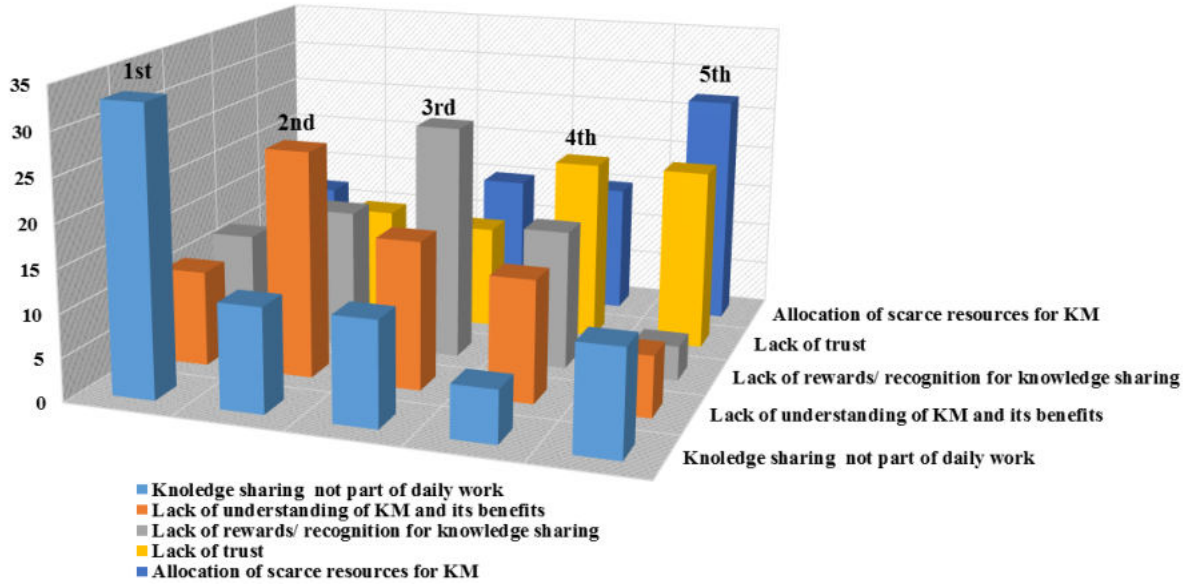
Sources: Authors Compilation

Interpretation

About the statement hence given it was found that the information about the process description can be uploaded to organization's database and the personal best practices can be shared with other employees very easily. Also the availability of enabling hardware and software technologies to support learning and a well-defined processes for creation, capture, and acquisition of knowledge and enabling hierarchal structures exist that facilitates communication flow and absence of Incentives to be provided to motivate users to learn from experiences and use KM system has also been depicted.

Ranking of Barrier to KM in Organisation

Graph-5

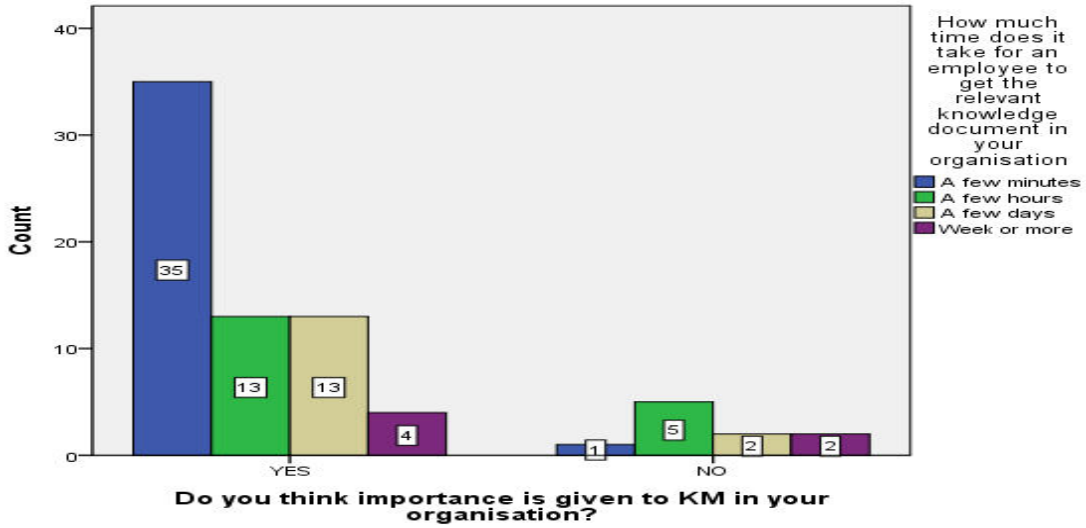


Sources: Authors Compilation

Interpretation

Knowledge sharing not a part of daily work has been found as the most responsible barrier for KM in organizations, Lack of understanding of KM and its benefits was found to the second most responsible factor, with Lack of rewards/ recognition for knowledge sharing been the third ranked, lack of trust been the fourth and Allocation of scarce resources for KM to be the least responsible barrier.

Graph-6: Cross Tabulation of Importance Given to KM and Time Taken to Retrieve Data



Sources: Authors Compilation

Table-1: Chi-Square Test between Time Taken to Importance of KM

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.798[a]	3	.032
Likelihood Ratio	9.073	3	.028
Linear-by-Linear Association	4.440	1	.035
N of Valid Cases	75		

Sources: Authors Compilation

Interpretation

It can be easily deduced from the above data that organizations where importance is given to Knowledge management have significantly low time gap in fetching the relevant information. This can be taken as a very important factor in supporting use of KM in organizations. Since the significance level, p-value = .032, which is less than α = .05, the assumed level of significance the test is statistically significant i.e. the two variables: Importance of KM and Time taken to get relevant knowledge are associated.

Table-2: Cross Tabulation of Organization Culture w.r.t. KM to Time Take to get Information

			How much time does it take for an employee to get the relevant knowledge document in organisation				
			A few minutes	A few hours	A few days	Week or more	Total
Which of the following best describes organisation culture w.r.t. new knowledge creation?	It's the job of R&D department only	Count	2	6	1	4	13
		% of Total	2.7%	8.0%	1.3%	5.3%	17.3%
	Everybody contributes to it	Count	34	12	14	2	62
		% of Total	45.3%	16.0%	18.7%	2.7%	82.7%
Total		Count	36	18	15	6	75
		% of Total	48.0%	24.0%	20.0%	8.0%	100.0%

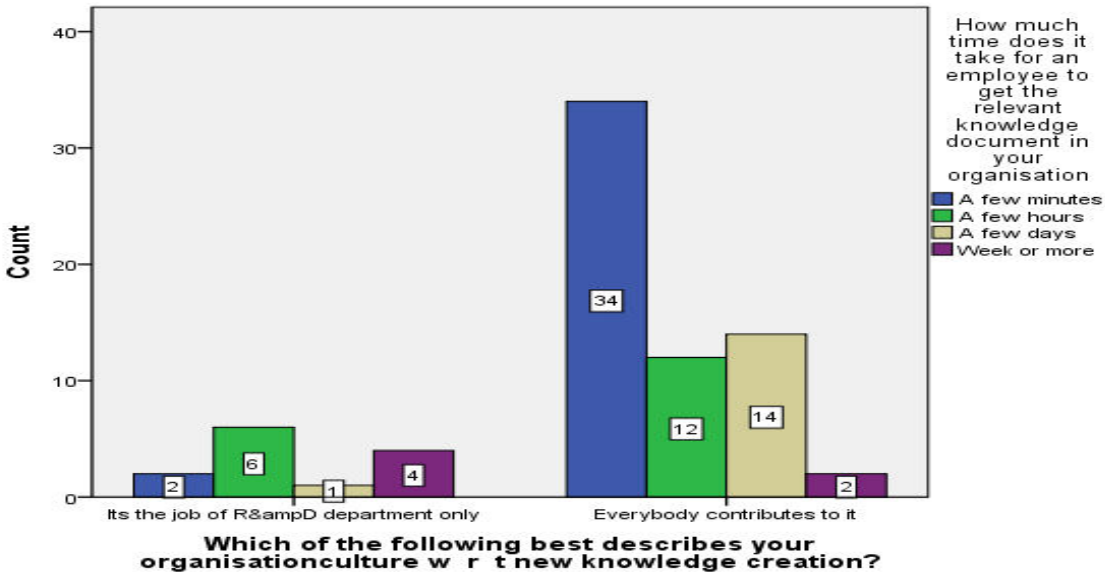
Sources: Authors Compilation

Table-3: Chi Square between Organization Culture w.r.t. KM to Time Take to get Information

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.083[a]	3	.000
Likelihood Ratio	15.821	3	.001
Linear-by-Linear Association	6.826	1	.009
N of Valid Cases	75		

Sources: Authors Compilation

Graph-7: Cross-Tabulation of Organisation Culture w.r.t. KM and Time Taken to Retrieve Data



Sources: Authors Compilation

Interpretation

It can be easily deduced from the above data that organizations where all the employees take part in sharing and management of new Knowledge in those organizations time gap in fetching the relevant information is significantly low. This can be taken as a very important factor in supporting the participation of all employees in KM activities. Since the significance level, p-value = .00, which is less than $\alpha = .05$, the assumed level of significance the test is statistically significant i.e. the two variables: Organization culture w.r.t. knowledge creation and Time taken to get relevant knowledge are associated.

Table-4: Cross Tab between Organisation culture w.r.t. new Knowledge Creation and Awareness about KM

			What do you think of Knowledge Management (KM)?				Total
			Never heard about it	It is just a management fad	It is strategic part of business	Something that could be beneficial for the organisation	
Which of the following best describes organisation culture w.r.t. new knowledge creation?	It's the job of R&D department only	Count	2	1	4	6	13
		% of Total	2.7%	1.3%	5.3%	8.0%	17.3%
	Everybody contributes to it	Count	0	4	35	23	62
		% of Total	.0%	5.3%	46.7%	30.7%	82.7%
Total		Count	2	5	39	29	75
		% of Total	2.7%	6.7%	52%	38.7%	100%

Sources: Authors Compilation

Table-5: Chi Square between Organization Culture w.r.t. KM to Awareness of KM

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.154[a]	3	.011
Likelihood Ratio	8.803	3	.032
Linear-by-Linear Association	1.143	1	.285
N of Valid Cases	75		

Sources: Authors Compilation

Interpretation

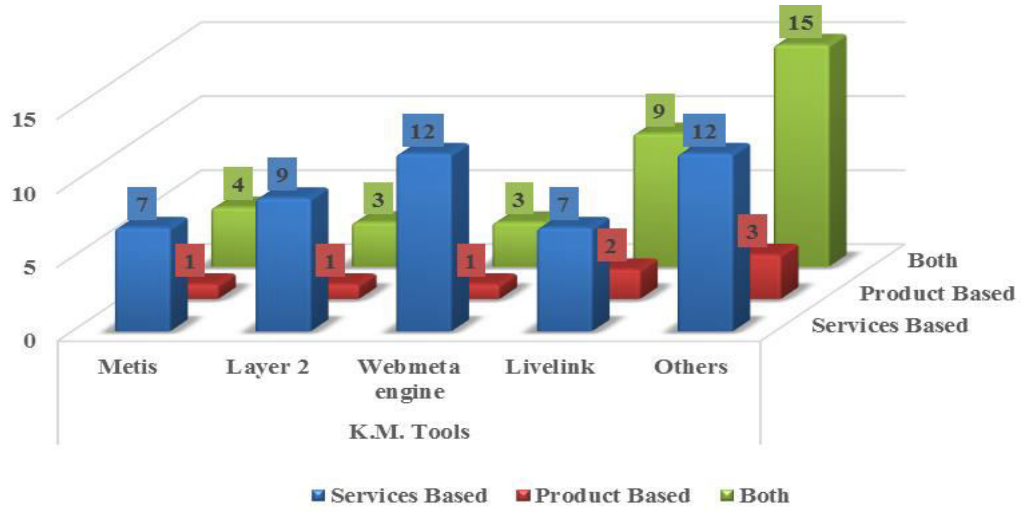
Observing the graph, we get a clear picture that the organizations who wanted to make KM a strategic part of their businesses have made all the efforts to involve the participation of all their employees in KM activities. Since the significance level, p-value = .011, which is less than α = .05, the assumed level of significance the test is statistically significant i.e. the two variables: Organization culture w.r.t knowledge creation and awareness about Knowledge Management are associated.

Table-6: Cross Tab between Type of Organisation and KM Tools used in Organisation

			KMtoolsused					
			Metis	Layer2	WebMeta Engine	Livelink	Other / Internal tools	Total
Type of organisation (V42)	Services based	Count	7	9	12	7	12	47
		% within V42	14.9%	19.1%	25.5%	14.9%	25.5%	
		% of Total	7.9%	10.1%	13.5%	7.9%	13.5%	52.8%
	Product based	Count	1	1	1	2	3	8
		% within V42	12.5%	12.5%	12.5%	25.0%	37.5%	
		% of Total	1.1%	1.1%	1.1%	2.2%	3.4%	9.0%
	Both	Count	4	3	3	9	15	34
		% within V42	11.8%	8.8%	8.8%	26.5%	44.1%	
		% of Total	4.5%	3.4%	3.4%	10.1%	16.9%	38.2%
Total		Count	12	13	16	18	30	89
		% of Total	13.5%	14.6%	18.0%	20.2%	33.7%	100.0%

Sources: Authors Compilation

Graph-8: Cross-Tabulation of Type of Organisation and KM Tools used



Sources: Authors Compilation

Interpretation

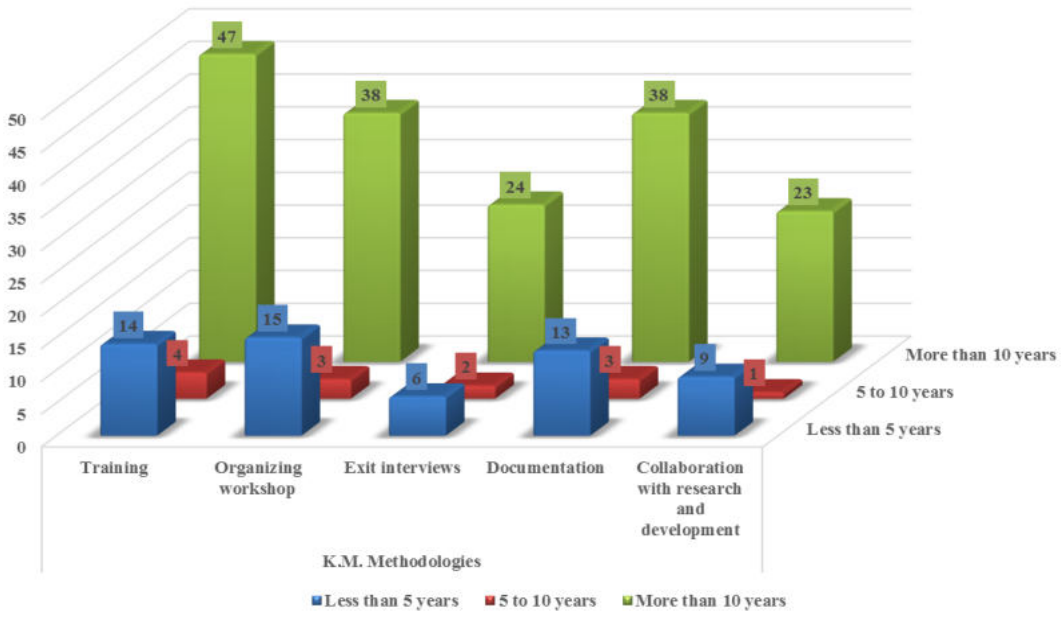
Seen from the graph above we see that services based organization prefer to use Webmeta engine and their personally self-developed tools for Knowledge management in their organization. While the use of self-developed KM tools are used extensively by product based as well as those organizations that have businesses in both the domain.

Table-7: Cross Tabulation between Age of Organisation and KM methodologies used in Firm

			Methodology KM					Total
			Training	Organising Workshops, Conferences	Exit Interviews	Documentation	Collaborations with R & D Centers etc	
Age of Organisation (V41)	< 5 years	Count	14	15	6	13	9	57
		% within V41	24.6%	26.3%	10.5%	22.8%	15.8%	
		% of Total	5.8%	6.3%	2.5%	5.4%	3.8%	23.8%
	5 -10 years	Count	4	3	2	3	1	13
		% within V41	30.8%	23.1%	15.4%	23.1%	7.7%	
		% of Total	1.7%	1.3%	.8%	1.3%	.4%	5.4%
	> 10 years	Count	47	38	24	38	23	170
		% within V41	27.6%	22.4%	14.1%	22.4%	13.5%	
		% of Total	19.6%	15.8%	10.0%	15.8%	9.6%	70.8%
Total		Count	65	56	32	54	33	240
		% of Total	27.1%	23.3%	13.3%	22.5%	13.8%	100.0%

Sources: Authors Compilation

Graph-9: Cross-Tabulation of Age of Organisation and KM Methodologies Used



Sources: Authors Compilation

Interpretation

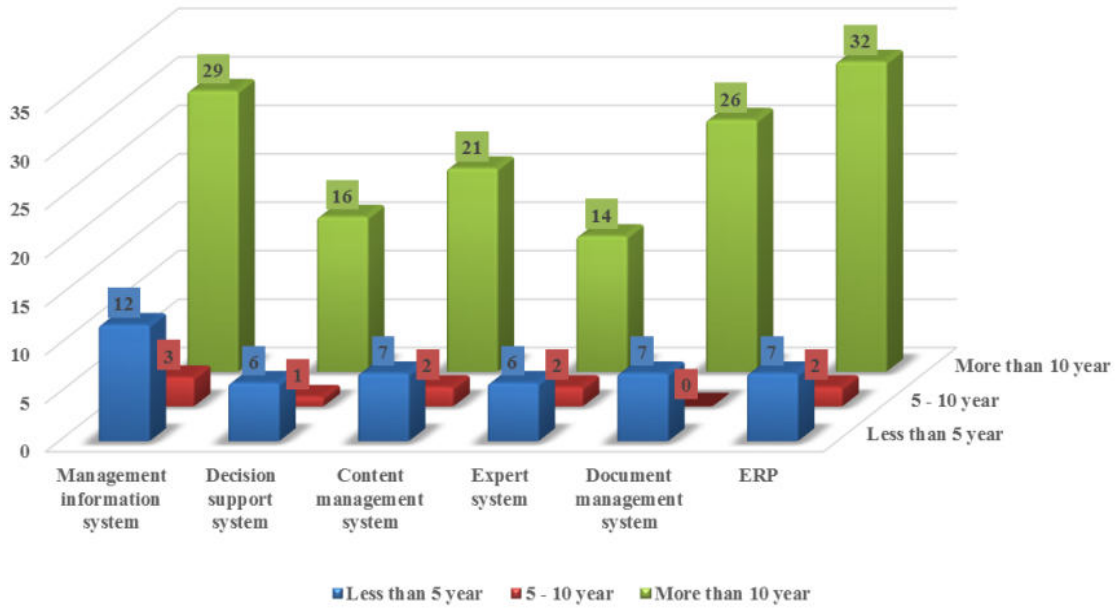
The graph above clearly depicts that the organizations having an age more than 10 years have applied all the various KM methodologies extensively for supporting their knowledge management functions. In addition, an interesting trend that can be seen is that newer organizations i.e. less than 5 years old have also implemented various KM methodologies aggressively for their knowledge management. This trend points out that newer organizations or ventures have very well understood and accepted the usefulness and need for knowledge management for better efficiency.

Table-8: Cross Tab between Age of Organisation and Systems Implemented used in Firm

			KMSystems						
			Management Information System	Decision Support System	Content Management Systems	Expert System	Document Management Systems	ERP	Total
Age of organisation (V41)	< 5 years	Count	12	6	7	6	7	7	45
		% within V41	26.7%	13.3%	15.6%	13.3%	15.6%	15.6%	
		% within KMSystems	27.3%	26.1%	23.3%	27.3%	21.2%	17.1%	
		% of Total	6.2%	3.1%	3.6%	3.1%	3.6%	3.6%	23.3%
	5 -10 years	Count	3	1	2	2	0	2	10
		% within V41	30.0%	10.0%	20.0%	20.0%	.0%	20.0%	
		% within KMSystems	6.8%	4.3%	6.7%	9.1%	.0%	4.9%	
		% of Total	1.6%	.5%	1.0%	1.0%	.0%	1.0%	5.2%
	> 10 years	Count	29	16	21	14	26	32	138
		% within V41	21.0%	11.6%	15.2%	10.1%	18.8%	23.2%	
		% within KMSystems	65.9%	69.6%	70.0%	63.6%	78.8%	78.0%	
		% of Total	15.0%	8.3%	10.9%	7.3%	13.5%	16.6%	71.5%
Total		Count	44	23	30	22	33	41	193
		% of Total	22.8%	11.9%	15.5%	11.4%	17.1%	21.2%	100.0%

Sources: Authors Compilation

Graph-10: Cross-Tabulation of Age of Organisation and Systems Implemented

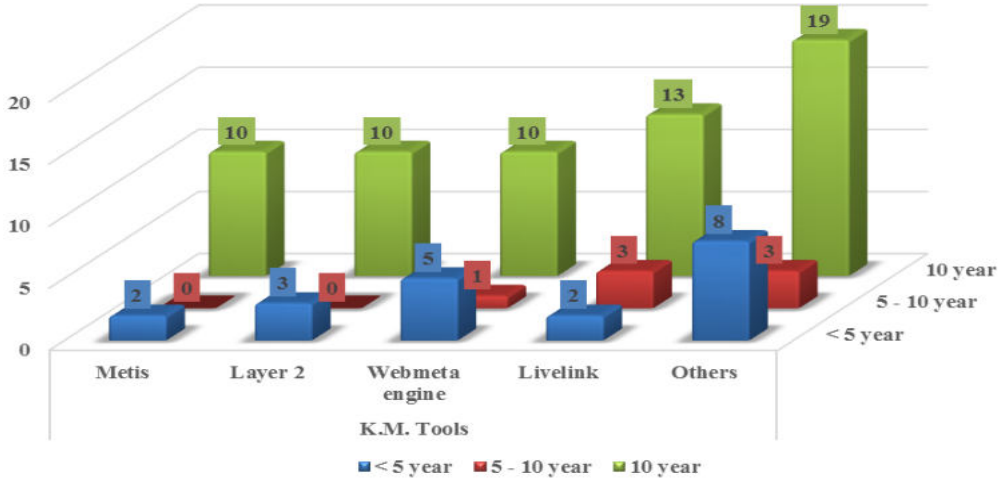


Sources: Authors Compilation

Interpretation

We see that in case of the organizations having age of more than 10 years have a significant use of these systems with the use of ERP been the most followed closely by management information system and document management system. In case of organizations, which are newer i.e. less than 5 years old, have again shown a highly level of KM application than the organization in the bracket of 5-10 years. Such newer organizations have shown more affinity towards management information system.

Graph-11: Cross Tab between Age of Organisation and KM Tools used in Organisation



Sources: Authors Compilation

Interpretation

From the off the shelf KM tools available to the organizations we find that Livelink and Webmeta engine are the most preferred tools been used in the industry. We see that in case of the organizations having age of more than 10 years has a significant usage of these KM tools. But it can also be seen clear that irrespective of how old the organization is all of them prefer to use a self-developed tools for knowledge integration.

RECOMMENDATIONS

- Organization having age of 5 -10 years should promote KM as they have been found to be lagging there.
- Organizations with age less than 5years should focus on reducing attrition rate.
- Organization in age group of 5-10 years should avoid downsizing, to maintain efficient knowledge management.
- To reduce the time gap in getting relevant knowledge, participation culture for all the employees should be promoted.
- To promote knowledge sharing in organizations, rewards / recognition for knowledge sharing should be given.
- Knowledge sharing should be made part of daily work.
- Improved and trusted off-the-shelf KM tools are made available.

LIMITATIONS

- The major limitation of the study was that people were not supportive to the survey. The number of people approached was double the sample size.
- Small sample size because of time and resource constraints.
- Geographical constraint is another limitation.
- Human bias may also be considered as al limitation.

CONCLUSIONS

- Out of 75 respondents, 39 agree to the fact that KM is a strategic part of their business and 29 agree to the statement that KM could be beneficial to the organization. This depicts a good awareness level of the benefits of KM to organization.

- There exist a clear majority about participation of employees in the management of knowledge i.e. 83 % respondent said that everybody contributes to it.

- 65 respondents, i.e. 87% agree to the fact that KM is given importance in their organization and only 10 i.e. 13% share that KM is not given enough importance in their organization.

- We found that organizations with age less than 5years have attrition as the biggest reason for knowledge loss, for organization in age group of 5-10 years downsizing has been found as the biggest reason for knowledge loss and for the organizations older than 10 years retirement has been found to the biggest reason for loss of knowledge. Whereas promotion has been found as a reason for knowledge loss for both 5-10 year and more than 10 years.

- From off the shelf KM tools available to the organizations Livelink and Webmeta engine, are the most preferred tools been used in the industry? However, it can also be seen clearly that irrespective of how old the organization is all of them prefer to use a self-developed tools for knowledge integration.

- An interesting trend that can be seen is that newer organizations i.e. less than 5 years old have also implemented various KM methodologies aggressively for their knowledge management. This trend points out that newer organizations or ventures have very well understood and accepted the usefulness and need for knowledge management for better efficiency.

- KM methodologies been used in different type of organizations are depicted - Training been used extensively in services based as well as organization having a presence in both areas, whereas exit interviews are given much importance in services based organizations. Documentation been another methodology is been used in services based organizations as well as in organization having a presence in both areas.

- Organizations in which importance is given to KM wanted and those who wanted to make KM a strategic part of their businesses have definitely taken a step further in spreading a culture of increasing the participation of all their employees in KM activities.

- Organizations where all the employees take part in sharing and management of new Knowledge in those organizations time gap in fetching the relevant information is significantly low. This can be taken as a very important factor in supporting the participation of all employees in KM activities.

- Knowledge sharing not a part of daily work has been found as the most responsible barrier for KM in organizations, followed by Lack of understanding of KM and its benefits.

- Attrition of the employees is ranked as most responsible for the loss of knowledge, followed by downsizing and promotion.

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A REVIEW OF VARIOUS PAGE REPLACEMENT TECHNIQUES INCLUDING 9 ALGORITHMS

Usha Gupta[16] Chanchal[17] Manoj Kumar Aren[18]

ABSTRACT

Whenever a page fault occurs in main memory, the operating system has to choose a page to remove from main memory in order to make a space for the new page to be brought in to the main memory in order to continue the execution of a large program. If the page that is to be removed from memory has already been modified while residing in the memory, must be written to the disk in order to bring the disk back up copy up to the date. However, if the page has not been modified, then the disk copy is already up to the date, so there is no need to write the page in to the disk. The page that is to be read in just overwrites the page being removed from the main memory. Over the years, many algorithms/techniques have been proposed for replacing a page from the main memory to the disk. This paper presents the major advanced page replacement algorithms along with their relative merits and demerits. A page replacement technique is called efficient if it produces minimum number of page faults. The main goal of these techniques is to minimizing the page faults occurrences as much as possible and reducing the cost of removing a page.

KEYWORDS

Page Replacement, Page Fault Handling, FIFO, Optimal, LRU, CLOCK, NFU, Counting Based Page Replacement, ARC, LRU-K, LIRS etc.

INTRODUCTION

Main memory is an important and a very limited source of storage in a computer system. For the purpose of removing a page from main memory, the page can be picked randomly from the main memory in order to evict or remove it from main memory to the disk at each occurrence of page fault, the performance of processor would be better if a page that is not heavily used is chosen first. If a heavily used page is chosen to remove, then it will be probable that the page which is removed is brought back in quickly, which in turn results in extra overhead. In this paper, various important page replacement techniques will be discussed. The problem of page replacement can occur in other areas of computer design. For example, most computers have one or more than one memory caches consisting of memory blocks of 32-bytes or 64-bytes. Therefore, when the cache memory becomes full, some of the pages or blocks have to be chosen for removal. This problem of page replacement needs shorter time scale (it has to be done in a few nanoseconds, not milliseconds as with page replacement). The reason for the shorter time scale is that cache block/page misses are satisfied from main memory, which in turn has no seek time and no rotational latency. As in many algorithms, performance is the main goal in designing a page replacement algorithm [1]. There are many factors that affects the performance of the page replacement such as if the size of the main memory has increased more than the speed of reading and writing in to the disk space that is the secondary memory. Therefore, if a page that has been swapped to a disk then the time taken to return it back in to the main memory has increased significantly because the main memory usage of programs has increased more than that of the speed of the secondary memory or disks.

HANDLING PAGE FAULT

A page fault is said to be occurred when a requested page is not present inside the main memory or can say that is not marked as 'present' in the main memory so the page is then needs to be brought from the secondary memory (disk). In such cases, an existing page from main memory is forced to be removed from main memory. The selection of such page is done with the help of page replacement algorithms. These page replacement algorithms try to minimize the occurrences of page faults [2] as much as possible and hence will result in low overhead.

The page faults can be classified in to two categories:

- Major Page Faults,
- Minor Page Faults.

In case of minor page fault, the referenced page is in main memory, but not yet marked 'present', which in turn means that there is no disk Input output (IO) required to handle the fault. Other page faults are caused by:

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1. Reference to address 0 (also called as invalid page fault).
2. Reference to an unmapped page (protection faults).
3. User process referencing the kernel area (protection faults).
4. Attempts to write to a read-only page (protection faults).
5. Attempts to execute code from non-execute page (protection faults).

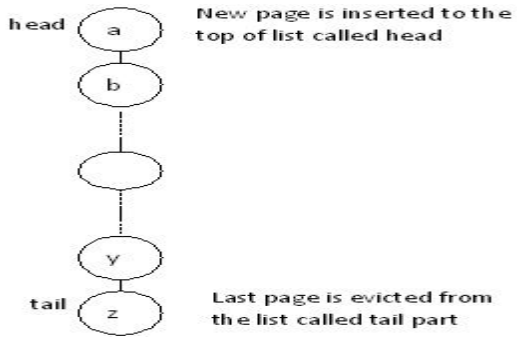
PAGE REPLACEMENT ALGORITHMS

Various page replacement algorithms explained through this paper are as follows:

First-In-First-Out (FIFO)

This is one of the very simple page replacement techniques. In this algorithm, the operating system maintains a list of the entire current page into the main memory a where the newest page is kept at the head and the oldest is in the tail part of the list. Whenever a page fault is occurs or we can say when a page needs to be evicted from the memory then the oldest page from the tail part (page Z in the figure) of the list is evicted and the new page (page A in the figure) is inserted to the head part of the list.

Figure-1



Sources: Authors Compilation

The implementation of FIFO is very simple and it has low overhead but it is not very efficient. FIFO does not take advantage of page access patterns or frequency. Most applications do not use memory, and subsequently the pages that hold it, uniformly, causing heavily used pages to be swapped out more often than necessary.

To analyze algorithms, consider stream of accesses; each access falls into a given page, e.g. 3 2 3 1 4 3 5 4 2 3 4 3 with frame size of 3.

Table-1

3	2	3	1	4	3	5	4	2	3	4	3
3	3	3	3	4	4	4	4	2	2	2	2
	2	2	2	2	3	3	3	3	3	4	4
			1	1	1	5	5	5	5	5	3

Sources: Authors Compilation

Optimal Page Replacement (min/opt)

The Optimal page replacement algorithm [3] is used when the main memory area is full, and the user always evicts a page that has not been referenced for the longest period. In this algorithm, whenever a page fault is occurred, x some set of pages is in main memory. One of these pages will be referenced on the next instruction and other pages may not be referenced for the 10, 100 or perhaps 1000 instructions later. So pages residing on the main memory can be labeled with the number of instructions that will be executed before that page is first referenced. Therefore, the optimal page replacement algorithm simply works by removing the page with the highest number of instructions labeled to the page. For example, if the page is not being used for say 6 million instructions and another page is also not being used for say 4 million instructions, then removing the former page from memory will push the page fault which in turn will fetch it back as far in to the future as possible. The main problem with this algorithm is that it is unrealizable; this is because at the time of page fault, the operating system does not have any way of knowing that which page is going to be referenced next. So in order to make this algorithm a realizable one, the implementation of this algorithm should be done in the second run, by recording the page usage on to the first run. This algorithm is often called as OPT or MIN [4]. It is difficult to implement and needs future knowledge in order to do forecasting.

To analyze algorithms, consider stream of accesses; each access falls into a given page, e.g. 3 2 3 1 4 3 5 4 2 3 4 3 with frame size of 3.

Table-2

3	2	3	1	4	3	5	4	2	3	4	3
3	3	3	3	3	3	5	5	5	3	3	3
	2	2	2	2	2	2	2	2	2	2	2
			1	4	4	4	4	4	4	4	4

Sources: Authors Compilation

Least Recently Used (LRU)

The LRU policy is based on the principle of locality. This algorithm works as: A page that is just being used it is probable that it will be used very soon, and a page that is not being used for a very long time, and then there is a probability that it will be remained unused. So this algorithm, Least Recently Used [5] can be implemented by keeping a sorted list of all pages in to the main memory. The list can be sorted by time factor, which is the time when the page was last used. This list is also called LRU stack. This means that on every tick of a clock, the position of the pages, which are used during that time of clock tick, must be up to date. Hence, this makes the implementation of this algorithm expensive one. There are certain disadvantages associated with this approach of replacing pages from main memory to secondary memory as: updating the positions of the pages on every tick of clock is an approximation and hence it makes it quite complicated, as it does not differentiate between two pages that were referenced to during the same clock tick. LRU involves constant space and time overhead for given main memory. The problem with this approach is the difficulty in implementation. One approach would be to tag each page with the time of its last reference; this would have to be done at each memory reference, both instruction and data. LRU policy [6] does nearly as well as an optimal policy, but it is difficult to implement and imposes significant overhead.

To analyze algorithms, consider stream of accesses; each access falls into a given page, e.g. 3 2 3 1 4 3 5 4 2 3 4 3 with frame size of 3.

Table-3

3	2	3	1	4	3	5	4	2	3	4	3
3	3	3	3	3	3	3	3	2	2	2	2
	2	2	2	4	4	4	4	4	4	4	4
			1	1	1	5	5	5	3	3	3

Sources: Authors Compilation

Not Recently Used (NRU) Clock

This algorithm approximates LRU algorithm along with a clock. In this type of page replacement algorithm, the pages in to the main memory are classified in to four categories of classes based on their usage at the last tick of clock.

Class 0: this class contains the pages of memory, which are neither being referenced nor modified.
Class 1: this class contains pages of memory that are not being referenced but have been modified.
Class 2: this class contains the pages that are referenced but not modified.
Class 3: this class contains the pages that are both referenced and modified.

Whenever a page that is required to be evicted or removed from main memory then, this algorithm pick up a random page to be evicted or removed from the lowest classes that contains the pages. Hence this algorithm is relatively simple to understand and easy to implement. The algorithm's implementation generates low overhead. However, it needs to clear the referenced bits after every clock ticks. Therefore, the performance of this algorithm is significantly better as compared to others.

To analyze algorithms, consider stream of accesses; each access falls into a given page, e.g. 2 3 2 1 5 2 4 5 3 2 5 2 with frame size of 3.

Table-4

3	2	3	1	4	3	5	4	2	3	4	3
3*	3*	3*	3*	2*	2*	2*	2*	4*	4*	4*	4*
	2*	2*	2*	2	3*	3*	3*	3	3*	3	3*
			1*	1	1	5*	5*	5	5	4*	4*

Sources: Authors Compilation
Note: * means R=1 (page was accessed since last scan). R also tells the usage counter of the pages.

Not Frequently Used (NFU)

This approximates LRU algorithm. In this type of page replacement algorithm, each page is associated with a usage counter, which is incremented on each tick of the clock as the page is being used. When a page is required to be evicted or removed from the main memory then, the page with the lowest usage counter value is removed or selected for the eviction process. Because of the usage counter values which are being associated with the page as it is being used so it could be possible that some processes which uses some of the pages very heavily, which in turn makes the pages tend to stay there in the memory for a long period of time, even if they are not being used actively anymore. This problem is count as the downside of this algorithm. In addition, the programs that just have started their execution do not get much space in the main memory, as the counter value for their usage is always starts from zero.

Counting Based Replacement

In this algorithm, the counter of the number of reference that has been made to each page is kept under consideration. In this, 2 schemes are used:

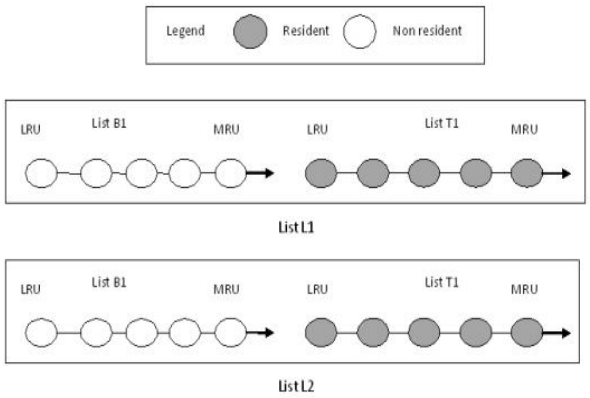
1. Least Frequency Used (LFU) Page Replacement Algorithm. It requires that the page with smallest count to be replaced.
2. Most Frequency (MFU) Used Page Replacement Algorithm. It is based on the argument that the page with the smallest count was probably just brought in and has yet to be used.

Adaptive Replacement Cache (ARC)

The Adaptive Replacement Cache (ARC) algorithm [7] basically provides an improvement over LRU based algorithms by taking two factors: the regency of pages and frequency of occurrences of pages into account. These two factors are accomplished by maintaining two lists, L1 and L2 and by remembering the history of the pages. These two lists together make a directory called as cache directory. The list L1 is used to capture the regency of pages and the list L2 to capture the frequency of occurrences of pages. The sizes of both the lists (L1 and L2) are kept at roughly as that of the size of the number of page frames in the main memory, say 'm'. Therefore, the history of at most m pages, not in the main memory, has to be remembered. The lists L1 and L2 are partitioned into two lists, T1, B1, and T2, B2, respectively as shown in the figure below.

Where: T1 contains in-cache pages that have been accessed only once, and T2 pages that have been accessed more than once, while on lists. Likewise, list B1 stores the history of pages evicted from the list T1, and B2 stores the history of pages evicted from the list T2.

Figure-2



Sources: Authors Compilation

ARC [8] is designed for databases and has operations on every page request, which makes it unsuitable for virtual memory. The figure is shown below of ARC Lists (i.e. the cache directory).

LRU-K method

The LRU-K [9] policy takes into account the regency information while evicting pages from memory. It does not consider the frequency factor. Because when taking the frequency factor in to consideration then this algorithm will evict the pages with the largest backward K- distance. The Backward K-distance of a page p is referred to as the distance measured from backward, means from the current time to the K^{th} most recent reference to the page p. Since this algorithm considers K^{th} most recent reference to a page, it will favor the pages, which are accessed frequently within a short time. As the value of K becomes higher, then it will not result in an appreciable increase in the performance, but in turn has high implementation overhead.

Low Inter-Reference Regency Set (LIRS)

The Low Inter-reference Regency Set algorithm [10] takes into consideration the Inter-Reference Regency of pages as the main, important factor for eviction. The Inter-Reference Regency (IRR) of a page is the number of other pages accessed between two consecutive references to that page. It is assumed that if current IRR of a page is large, then the next IRR of the block is likely to be large again and hence the page is suitable for eviction as per Optimal (MIN) algorithm. It needs to be noted that the page with high IRR selected for eviction may also have been recently used. The algorithm distinguishes between pages with high IRR (HIR) with the pages having low IRR (LIR).

The number of LIR and HIR pages is chosen such that all LIR pages [11] and only a small percentage of HIR pages are kept in cache. Now, in case of a cache miss, the resident HIR page with highest regency is removed from the cache and the requested page is brought in. Now, if the new IRR of the requested page is smaller than the regency of some LIR page, then their LIR / HIR statuses are interchanged.

CONCLUSIONS

Through this paper, it is very much cleared that the evolution of page replacement algorithms has shown two clear trends. First is analyzing the algorithm for better performance has been proved for real world problems, and by implementing these algorithms on operating system.

The second trend is the realization of the need of workload adaption (by handling large programs in to memory for execution through these page replacement procedures) even though the memory is only available in small fraction. The optimal algorithm replaces the page referenced last among the current pages. Unfortunately, there is no way to determine which page will be last, so in practice this algorithm cannot be used. It is useful as a measuring tool against which other algorithms can be measured.

The NRU (CLOCK) algorithm divides pages into four classes depending on the state of the *R* and *M* bits. A random page from the lowest numbered class is chosen. This algorithm is easy to implement, but it is very crude. Better ones exist. FIFO keeps track of the order pages were loaded into memory by keeping them in a linked list. Removing the oldest page then becomes trivial, but that page might still be in use, so FIFO is a bad choice.

Second chance is a modification to FIFO that checks if a page is in use before removing it. If it is, the page is spared. This modification greatly improves the performance. LRU is an excellent algorithm, but it cannot be implemented without special hardware. If this hardware is not available, it cannot be used. NFU, which is an approximate LRU algorithm, is not very good. Page replacement plays only a small role in overall performance of applications but provides real benefits.

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11. Song, Jiang, & Xiaodong, Zhang. (2002, June). In ***Proceeding of 2002 ACM SIGMETRICS, LIRS: An Efficient Low Inter reference Recency Set Replacement Policy to Improve Buffer Cache Performance***, (pp. 31-42).

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THEORETICAL FRAMEWORK OF ENTERPRISE RESOURCE PLANNING SYSTEM FOR UNIVERSITY OF KUMAUN

Suresh Chandra Wariyal[19] Nitin Pandey[20] Sanjeev Bora[21]

ABSTRACT

In order to research into the critical success factors for an ERP implementation and to have a guidance framework to conduct an examination and capture research data, a theoretical framework has been developed to aid research process. The research introduces how the model has been arranged, discussing current quality frameworks, current information success frameworks and ERP success frameworks. In order to develop a useful theoretical framework that can aid the data collection process and to assess specific success factors for implementing, an ERP system in a university environment, it is important to assess existing frameworks that have been used to classify IS success in literature. Paper will discuss the existing frameworks present in literature and examine the usefulness that these frameworks offer to the research questions this project investigates.

KEYWORDS

ERP, IS, University of Kumaun etc.

INTRODUCTION

In order to research into the critical success factors for an ERP implementation and to have a guidance framework to conduct an examination and capture research data, a theoretical framework has been developed to aid the research process. This research introduces how the model has been arranged, discussing current quality frameworks, current information success frameworks and ERP success frameworks. The different factors that are addressed in the chosen model are described in detail, a description of the use of the model is presented and finally a summary of the main points will follow.

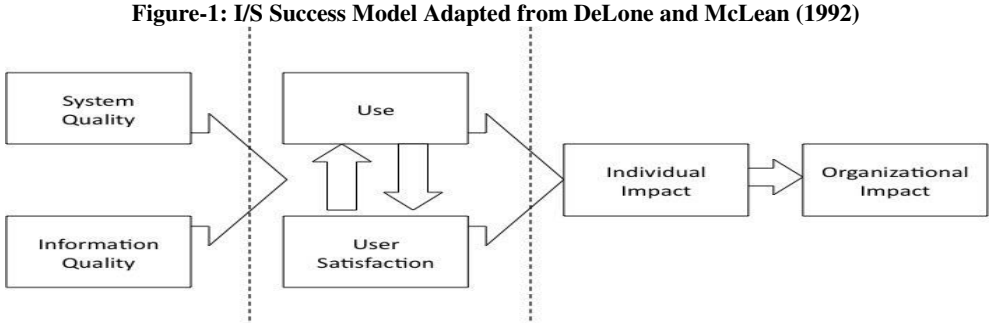
DETERMINATION OF MODEL

In order to develop a useful theoretical framework that can aid the data collection process and to assess specific success factors for implementing, an ERP system in a university environment, it is important to assess existing frameworks that have been used to classify IS success in the literature. This following section will discuss the existing frameworks present in the literature and examine the usefulness that these frameworks offer to the research questions this project investigates.

DeLone and McLean's I/S Success Model

DeLone and McLean's model (1992) was chosen, as it is one of the most referenced frameworks related to implementation success. The paper incorporates six main success factors as measurements for success. Their study (DeLone and McLean 1992) included an analysis of the literature in connection with practitioners and academics views on information system success and how it was achieved. The authors found that there is no 'one measure' in order to view an information system success and thus they developed six different factors (see Figure 3 below) in an 'I/S Success Model'. The six success categories identified are the system quality, information quality, use, user satisfaction, individual impact and organizational impact.

Figure-1: I/S Success Model Adapted from DeLone and McLean (1992)



Sources: DeLone, W. & McLean, E., 1992, 'Information System success: The quest for the dependent variable', Information System Research 3(1), 36 D&M DeLone and McLean.

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The model above was developed so that the authors (DeLone and McLean 1992) could 'predict' future IS success and organize the diverse research previously conducted on IS success and show the relationships. System quality concerns the desired characteristics of the system itself, which produces the information, while information quality stresses characteristics of the information and its desired form. Use and user satisfaction was found relevant from studies that attempted to analyze and measure the interaction of the information product with its recipients. The individual impact factor relates to what influence the information product has on management decisions. Finally, the organizational impact factor derives from research that has investigated the effect of the information product on organizational performance.

The relationships between system quality and information quality is that they singularly and jointly affect both use and user satisfaction. The amount of use can influence the degree of user satisfaction and vice versa. Use and user satisfaction offers the background to the individual impact and this individual impact was found to eventually have some organizational impact (DeLone and McLean 1992). It is worthwhile to note that DeLone and McLean's I/S model (1992) shows the actual dependencies between the relationships of the different success factors as well as recognizing and grouping the factors into categories as described above.

This model has been found to be very relevant to IS researchers (Bowtell et al. 1999) and with a selected mix of ERP success factors (see section below), this I/S success model will be a basis for the theoretical framework.

EXISTING ERP CRITICAL SUCCESS FRAMEWORKS AND THEORIES

A number of ERP implementation projects have been reported as 'failed' because of reportedly substantial economical difficulties (Donovan 2000; Mearian 2000; Stedman 2000; Coffin and G. 2001). Within the ERP research field, a number of researchers have looked at ERP success and how to ensure ERP implementation success (Brown and Vessey 1999; Bonner 2000; Smyth 2001a). Following this, the field has focused specifically on critical success factors in trade press and research publications and a number of non-industry specific CSF's have been introduced as an aid to assist these ERP project failures and future ERP projects to come (Bingi et al. 1999; Holland and Light 1999; Markus and Tanis 1999; Sumner 1999; Wee 1999; Robinson 2000; Trimble 2000; Al-Mudimigh et al. 2001; Gable et al. 2001a; Kuang et al. 2001; Smyth 2001b; Gunasekaran et al. 2002; IIIT n.d.).

Consequently, a few of the newest CSF's established have focused on more specific issues, such as vendors/related ERP system types (Clegg et al. 2001; Esteves 2002) and country specific differences (Corbitt et al. 2000).Different publications has also focused on measuring and attempting to predict the return of investment (ROI) that the ERP system will bring (Dinn 1999; Rosemann and Wiese 1999; Donovan 2000; Gable et al. 2001b; Stensrud 2001; Sommer 2002).

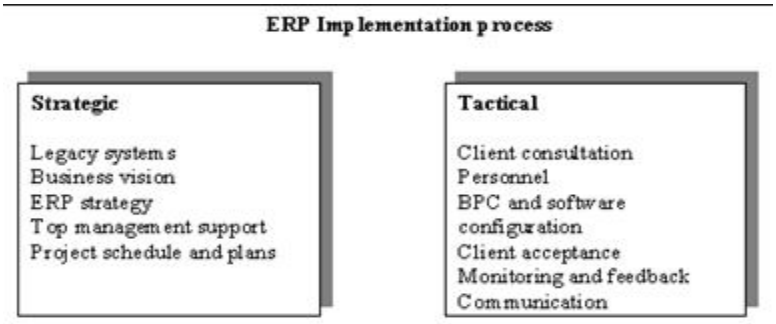
One of the most extensive reviews of critical success factors in ERP implementations that currently exists to date (2002) is Nelson and Somers (2001) paper. This paper describes and ranks 22 critical success factors for ERP implementations according to the stages of implementation.

A shortcoming of Nelson and Somers' (2001) research is that only 3 out of 86 'companies' (≈3.5%) in the industry surveyed belong in the education sector, thus it is hard to judge whether all these CSF's are relevant to the HES in India (the research described above had a focus on US based companies).

Holland and Light's Critical Success Factors Model

Holland and Light's model (1999), as shown in Figure below, was chosen to display the strategic and tactical factors that exist within an ERP implementation process. This model was derived from Pinto and Slevin's (1987) earlier work on strategy and tactics. This model can be seen as important as it focuses on the actual organization, strategic and tactical processes that can exist in an ERP implementation process from a management perspective, hard to judge whether all these CSF's are relevant to the HES in Australia (the research described above had a focus on US based companies).

Figure-2: A Critical Success Factor Model with Strategic and Tactical Factors Adopted from Holland and Light (1999)



Sources: Dezdar and Sulaiman (2009)

Brown and Vessey's ERP Implementation Framework

Brown and Vessey (1999) focused on existing IS research literature and ERP cases to develop a model able to identify variables that might be critical to successful implementation of ERP systems. The authors derived this model (see Figure below) from existing literature and found that three factors could be found to influence the actual ERP implementation approach and these factors were grouped under organizational context, ERP package capabilities sought and ERP package choice and project scope.

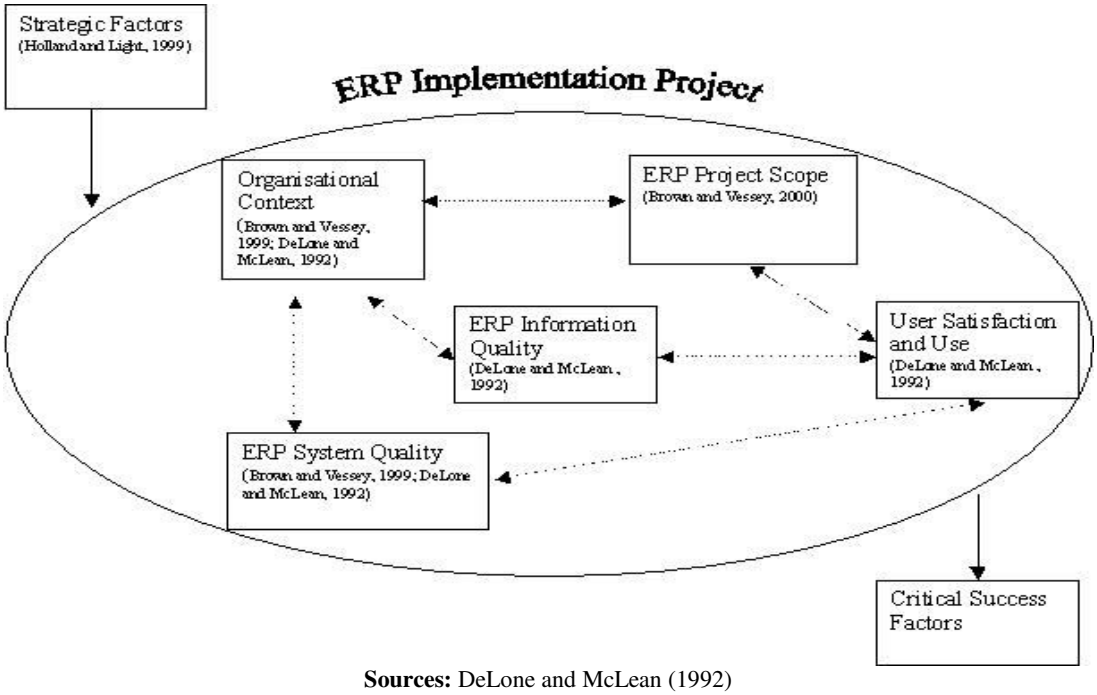
THEORETICAL FRAMEWORK

Huberman and Miles (1994) argue that a theoretical framework should be used to explain the main issues to be studied. Walsham (1995b, p. 76), expressed the following "the motivation for the use of theory in the earlier stages of interpretive cases studies which takes account of previous knowledge and which creates a sensible theoretical basis to inform the topics and approach of the early empirical work". The framework below (Figure) has been developed. The framework is based on the existing literature on information systems success, implementation of information systems and ERP systems and previous studies conducted on ERP critical success factors. The development of a theoretical framework is part of the research strategy that the researcher has adopted.

The framework (Figure below) is represented by six factors, namely the strategic factor, organizational context, ERP system quality, ERP information quality, ERP project scope and user satisfaction and use. The strategic factors are represented as influencing the whole ERP implementation approach and thus it is represented with an arrow leading into the defined boundary that the reminding five factors are grouped. Within the ERP implementation boundary (represented as a circle in the figure), the ERP implementation project phase, the five remaining factors are suggested. The author chooses to view a boundary in this context in the same meaning as Reynolds and Star (2001), where the boundary concerns a limitation from the rest of the environment that the researcher will focus on. The theoretical framework offers the possibility to group complex issues of investigation together in a more manageable research overview for the researcher. The theoretical framework assisted in the use of the Nvivo software utilized to analyze the research data.

The arrows in the framework refers to the how DeLone and McLean (1992) viewed the different factors to influence each other. The CSF's interdependency will not be covered in depth here, however, the researcher still find it important to be aware of the relationship between the factors, thus the proposed arrows (interdependencies) are shown. Critical success factors are represented at 'the underside' of the framework, representing that all of the factors will be considered when evaluating the success factors. The figure below outlines the theoretical framework developed for this research project.

Figure-3: Theoretical Framework



Sources: DeLone and McLean (1992)

The theoretical framework helps to identify the areas of interest depending on the interviewee's role and responsibility in the ERP implementation project.

Strategic Factors

This factor was chosen based on Holland and Light's (1999) framework, as identified in section 2.2.1 above, that focused on the classification of ERP implementation processes and the diverse factors that affects an ERP implementation project. The word strategy in this context concerns the adjustment of a plan to the anticipated reactions of those who will be affected by the plans, such as competitors, customers and the actual organization. Often plans can differ in structure, but a strategy commonly contain a mission, vision, values, strategic directions, objectives, key strategies, performance outcomes, operational plans and accountabilities (Chandler 1962; Drucker 1990). The plan should be developed after consultation with all levels of the organization (Anthony 1965; Anderson et al. 1999). Naturally, in strategic factors, it will be relevant to investigate the strategic use of information systems to gain or improve competitive advantage for the organization (Porter 1985a; Kearns and Lederer 2000). An ERP has been reported to improve an organizations' competitiveness in a given market, while also improving the organizational value (economical gains) (Soh and Markus 1995), and can be seen as a strategic choice for organizations (Holland et al. 1999).

Within the HES in Australia, questions that will be asked concern finding out key characteristics of the organization, including industry and competitive strategy and if the organization is actually viewing the ERP implementation project as a strategic solution (Jenson and Johnson 1999). Within this factor, it is important to categorize whether an organization views the strategic IT/IS approaches as an outsourced or partly outsourced activity or not (Pinnington and Woolcock 1995; Kern and Willcocks 2000) and to what extent there can be knowledge sharing between the outsourcing partner and the organization that receives the service (Lee 2001). This factor is modeled in the theoretical framework (Figure 6 Theoretical Framework) as it is believed that it will affect the whole implementation project and the different factors in the ERP implementation project.

Organizational Context

Within the IS field it was reported by Ervasti and Iivari (1993), that existing studies with regarding IS acquisitions were close to zero. Hirschheim and Smithson (1998) found that managers should include a return on investments (ROI) while evaluating the possibilities of an IS and other authors have found that management should state benefits from expected information system developments (Ahituv et al. 2000). Previous studies conducted on CSF's have focused on organizational issues concerning the changes that will occur during an ERP implementation project and how best to evaluate these changes and care for these changes in an optimal way (Edwards and Panagiotidis 2000; Aladwani 2001). This factor is necessary to include in a framework when evaluating factors for success for implementing an IS in a university setting as ERP systems are large systems that are difficult to implement in a university environment (McConachie 2001).

DeLone and McLean (1992) argued that it was important to evaluate the effects the information system had on organizational performance. Brown and Vessey (1999) found this to be true for ERP implementation projects as they included this factor when looking at their model for ERP implementation. ERP implementation influences the organization in a number of ways and these changes will be questioned in order to derive CSF's for an ERP implementation project in a university environment. Specifically, this factor will investigate how the ERP system and the ERP implementation team perceive existing and future roles and responsibilities in the university when an ERP system is introduced. The factor will look at issues concerning 'how things are done around here', as expressed by Earl (1996). In the theoretical framework above, the organizational context is modeled as influencing the system quality and the system quality is modeled as influencing the user satisfaction and use.

ERP System Quality

It has been seen that IS quality has a broader perspective than other quality ideas represented within the IT industry (such as software quality (Andersson and von Hellens 1997)). In addition, different factors of quality may be of importance to different groups of individuals (Eriksson and Törn 1991). Another interesting point of view is that presented by Dahlberg and Järvinen (1997) who claim that too much focus has been placed on technical aspects when focusing on quality issues. However, the importance of information system quality (ISQ) and management of this (Total Quality Management, TQM) has been identified as important by a number of researchers (Braa 1995; Eriksson and Törn 1997).

Basically, the improved 'desired characteristics' of an information system (an information system definition is described in section 2.1.1 above), the more improved implementation, maintenance, cost in different terms, training and ease of upgrading be of the ERP implementation in the long. An ERP, by nature, is a one-system-only information system that models all the business processes (Rosemann and Wiese 1999) in one, the management of this is seen to be crucial for the success of the organization. This is evidently a fact, as information technology and the utilization of IT by using information systems are factors that lead to competitive advantage in today's world (Earl 1990). The questions that this factor will address concern the functionality of the system and how the users' perceive. Address also technical issues such as security and versions of the ERP system will to some extent also.

ERP Information Quality

DeLone and McLean (1992) found that researchers had focused on the system ability to produce desired information. The ERP information quality concerns the actual information produced by the ERP system. An ERP system's main selling points is its

ability to streamline the information flow in the organization (Laberis 1999), thus this should be investigated also in a university environment. The organizational context is influencing the actual information quality, while the user satisfaction and user will be influenced by the quality of the information that the ERP system produces.

ERP Project Scope

The existing IS literature has focused on top management support (Kaiser and Srinivasan 1987; Jarvenpaa and Ives 1991; Raman et al. 1993) and the actual risk of developing and implementing systems (Barki et al. 1993). Top management support can be categorized as the actual commitment of senior executives to support the implementation project of any system. In the IS implementation field, there has also been a focus on having the information technology or project champion. Where project champions are more than ordinary leaders, they could be characterized as transformational leaders who inspire others to transcend self-interest for a higher collective purpose (Beath 1991).

ERP implementation projects have been found in the literature to different from 'normal' IT projects and should be treated differently in how they are managed and organized (Austin and Nolan 1998) and it is this management and scope that this factor will address. No research has been previously conducted on this factor with a view on how to introduce and implement an ERP system into a university environment (except for research already conducted at the research site that has focused on different users (Mayer 2000) and cultural issues (Beekhuyzen 2001)). The ERP project scope will in the research project concern how the actual project team was run, information given to people and users affected by changes and how the business changes were chosen. The ERP implementation approach and how the implementation team operates are also of an interest. The ERP project scope is modeled as influenced by the organizational context and in the same way influence the organizational context and the user satisfaction and use of the ERP system. The organizational context is influencing the actual information quality, while the user satisfaction and use will be influenced by the quality of the information that the ERP system produces.

User Satisfaction and Use

DeLone and McLean (1992) focused on the user satisfaction and the use of the information system. This factor was viewed as a potential factor for evaluating a systems success. Within the IS research field, a number of papers have focused on user satisfaction (Bailey and Pearson 1983; Baroudi et al. 1983; Etezadi-Amoll and Farhoomand 1991; Lawrence and Low 1993). Some research has also focused on the outcome user involvement and participation can have on the end user satisfaction of the system (Lawrence and Low 1993; Barki and Harwick 1994; Beeler and Hunton 1997). Beck et al (2000) investigated the different stages of an ERP systems use and how the ERP system was utilized in the organization but no real research exists with the use of an ERP system in an Australian university environment. The closest connection can be found in McConachie's (2001) paper where she finds that the users of the PeopleSoft system at Central Queensland University (CQU) in Australia were found to be 'change weary'. McConachie also reported on differences in academic users and administrative staff users of the system and reported that the users had no real shared value of the system (McConachie 2001).

User satisfaction can be defined as the extent of which users believe the information system available to them meets their information and system requirements (Baroudi et al. 1983). DeLone and McLean (1992) found that the use and user satisfaction was related to the system and information quality (in this theoretical framework they will be called ERP information quality and ERP system quality). Brown and Vessey (1999) found the ERP project scope to affect the user satisfaction and use of the ERP system. Within this context, it will be valuable to see how the users of this system (academics, staff and staff, see Appendix S: NABS and ARPP System Functionality) perceive the ERP system and how useful they find it. It has been reported in IS research that the users of systems can choose not to use systems and try to work around the system (Orlikowski 1992). As an ERP system offer the organization predefined operational business best practices (Taylor 1998), questions of interests then are whether the users believe that the actual system captures their knowledge and truly models the users knowledge and the actual business processes they performed before the system was implemented. Other related concepts with this factor involves training the users of the systems receive, conflicts between users, system ownership and if the users feel that they have been able to express their views if they have felt dissatisfied during implementation or during the use of the system.

CONCLUSIONS

Measuring information system success is a key problem for IS researchers (Mathieson 1993). Some authors describe success based on meeting the budget, while others classify a successful ERP implementation as meeting the deadline for the project. Success can look different when examined at different points in time, on different dimensions or from different views (Larsen and Myers 1997; Markus and Tanis 2000). Within this paper, a theoretical framework is proposed in order to establish key factors for investigation what the success factors comprise of implementing an ERP system in a university environment and not particularly on the measurement of those factors.

The theoretical framework was developed after a through an extensive literature review on existing quality frameworks and existing critical success factor models for ERP implementations. The theoretical framework developed compromises six different factors. These six factors will be used in the research project, and they are found to be strategy, organizational context, ERP system quality, ERP information quality, ERP project scope and user satisfaction and use.

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ROLE OF DATA MINING AND WAREHOUSING IN POVERTY ALLEVATION

Bhupesh Rawat[22] Nirmal Pandey[23]

ABSTRACT

The World Wide Web is a broadcast medium where a wide range of information can be obtained at a low cost. Information on the WWW is important not only to individual users, but also to the business organizations. Especially when the critical decision-making is concerned. In this paper, we have discussed that how Data mining can help an organization in strategic decision making that in turn will help it to grow its business and at the same time to create more job opportunities and lower poverty. Since the roots of poverty can be found in the unequal distribution of resources and opportunities with the help of data mining techniques we can reduce the poverty.

KEYWORDS

Data Mining, Warehousing, Poverty Alleviation, KDD, Spatial Databases, Overt Maps, Econometrics, K-Mean etc.

DATA MINING

Data mining has attracted a great attention in the information industry and in society as a whole in recent years, due to wide availability of huge amount of data and the imminent need for turning such data into useful information and knowledge.

The information and knowledge gained can be used for application ranging from market analysis, fraud detection, to production control, disaster management and science exploration.

Data mining can be viewed as a result of the natural evolution of information technology. The database system industry has witnessed an evolutionary path in the development of various functionalities:

Data collection and database creation, database management (including data storage and retrieval, and database transaction processing and advance data analysis Knowledge discovery as a process consists of an iterative sequence of following steps:

- Data cleaning, that is, to remove noise and inconsistent data.
- Data integration, that is, where multiple data sources are combined.
- Data selection, that is, where data relevant to the analysis task are retrieved from the database.
- Data transformation, that is, where data are transformed or consolidated into forms appropriate for mining by performing summary or aggregation operations.
- Data mining, that is, an essential process where intelligent methods are applied in order to extract the data patterns.
- Knowledge presentation, that is, where visualization and knowledge representation techniques are used to present the mined knowledge to the user

SPATIAL DATA MINING

Spatial data mining is the process of discovering interesting and previously unknown, but potentially useful patterns from large spatial datasets.

Extracting interesting and useful patterns from spatial datasets is more difficult than extracting the corresponding patterns from traditional numeric and categorical data due to the complexity of spatial data types, spatial relationships, and spatial autocorrelation.

The explosive growth of spatial data and widespread use of spatial databases emphasize the need for the automated discovery of spatial knowledge.

Spatial data mining is the process of discovering interesting and previously unknown, but potentially useful patterns from spatial databases.

The complexity of spatial data and intrinsic spatial relationships limits the usefulness of conventional data mining techniques for extracting spatial patterns.

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K-MEANS ALGORITHM

The algorithm for partitioning, where each cluster's centre is represented by mean value of objects in cluster.

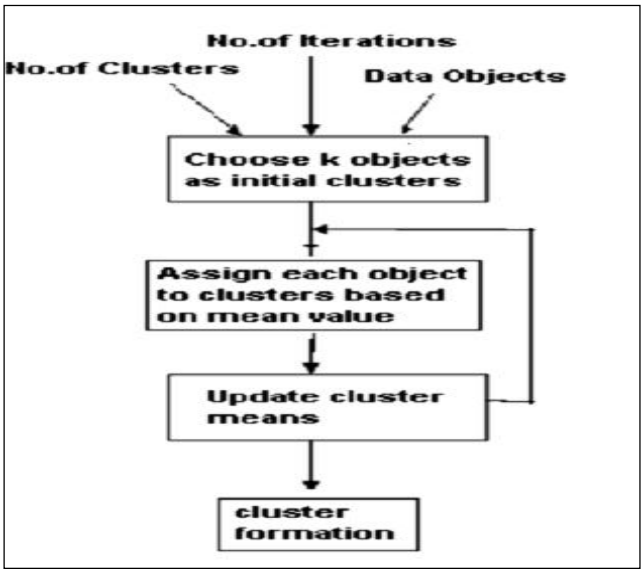
Input:

k: the number of clusters,
D: a data set containing n objects.
Output: A set of k clusters.

Method:

- Arbitrarily choose k objects from D as the initial cluster centres.
- Repeat.
- (re)assign each object to the cluster to which the object is most similar, based on the mean value of the objects in the cluster.
- Update the cluster means, i.e. calculate the mean value of the objects for each cluster.
- Until no change.

Figure-1: Cluster Formation through K-Means



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Data mining helps us to take decision. For example a company can take decision about opening a plant in a particular location. Opening a plant at a location will increase job opportunities and in some sense will reduce poverty.

The computer technology that drives Geographic Information Systems (GIS) has become simpler to use as well as more powerful, making it easier for people to create maps and spatial databases out of information that otherwise would remain as tables of numbers. Data mining techniques have enabled researchers to discover statistical relationship linking poverty with information found in census and other sources.

Finally econometric techniques have been developed and refined notably by economist working at the World Bank, that permit the estimation of poverty rates at much higher spatial resolution generally available before. These maps, and the spatial databases underlying them, open up lines of investigation into the relationship between poverty and geography that could only be weakly approximated before, because poverty information was not organized along geographic lines.

Now we can begin to better understand the interaction between poverty and such geographic factors as coastal proximity, climatic conditions, elevation, access to transportation networks, exposure to natural disasters, and other important drivers. Poverty maps are vital to the success of this critical area of scientific research. Poverty maps are also being used in creative new ways to support practical efforts to reduce poverty. The maps permit more effective targeting of poverty reduction efforts by enabling decision makers and the public to visualize the problem they are attempting to solve.

They permit more precise delivery of disaster relief services to vulnerable populations. They enable planners to identify priority areas for intervention. They make it possible to better tailor poverty reduction activities in ways that take into account important geographic differences, for example, with respect to ecosystem services.

As more countries begin to generate poverty maps at multiple points in time, it has become possible to track the progress of implementing poverty reduction goals. Because maps can communicate complex patterns in powerful, visually compelling ways, their monitoring dimension can be especially useful.

In spite of these great advances in the production and use of poverty maps, their full potential has not yet been realized. Some countries lack adequate combinations of survey and census data. Others lack the ability to utilize available data to the full extent necessary. As a result, most countries still do not have poverty maps.

Moreover, many of the maps produced thus far are not readily available to researchers and planners, limiting the capacity of maps to shed new light on the science and practice of poverty reduction. Our purpose is to shed a spotlight on the pioneering work that has been done in this area, and to inspire continued innovation and progress.

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SYNTHESIS AND CHARACTERIZATION OF SOME ORGANIC AND INORGANIC CHLORIDE DERIVATIVES

G. Pandiaraj[24] K Agalya[25]

ABSTRACT

Crystal plays a major role in the applications of modern science and technology. A series of organic and inorganic crystals such as Thiourea + Zinc Chloride, Semicarbazide Hydrochloride + Lithium Chloride and Samarium Chloride have been successfully synthesized by using solution growth method and slow evaporation techniques. The FTIR, and UV data of the structural compound were studied and the micro hardness measurements suggest that crystal is hard in appearance. The crystal growth procedure and the structural compound with their applications are discussed in this paper.

KEYWORDS

FTIR, UV, Micro Hardness, Slow Evaporation, SDBS, Pressed Pellet Technique etc.

INTRODUCTION

A crystal is a solid material, whose constituent atoms, molecules, or ions are arranged in a regular pattern extending in all three spatial dimensions. Materials in crystalline form have good optical and electrical properties. Crystal growth is an interdisciplinary subject covering physics, chemistry, material science, chemical engineering, metallurgy, crystallography, mineralogy, etc. in the past few decades, there has been a growing interest on crystal growth processes particularly in view of the increasing demand of materials for technological applications.

CRYSTAL GROWTH PHENOMENA

Nucleation is an important phenomenon in crystal growth because it controls the growth rate to obtain good quality single crystal. The process of crystals formation and crystal growth is called "nucleation". In simple words, the molecules of the particular element start combining with each other and create crystal or grow the size of crystal in this process. The growth of crystals from liquid and gaseous solutions such as pure liquid and pure gases can also occur if some degree of super saturation or super cooling has first been achieved in the system.

Slow Evaporation Method

This method is similar to the slow cooling method in terms of the apparatus requirements. The temperature is fixed and provision is made for evaporation with non – toxic solvents like water, it is permissible to allow evaporation into the atmosphere. Typical growth conditions involve a temperature stabilization of about 0.05°C and rate of evaporation of a few nm^3/h. The evaporation technique has an advantage that the crystals grow at a fixed temperature.

Growth of Thiourea With Zinc Chloride ($ZnCL_2$)

In order to prepare a good crystal, at room temperature a suitable supersaturated solution of Thiourea and zinc chloride are required. The molecular weight of $ZnCl_2$ => 136.28 g/mol

Procedure: To grow a good single crystal of Thiourea with $ZnCl_2$, 1:1 ratio of thiourea and $ZnCl_2$were prepared as follows:

- A well-cleaned beaker was taken with 10ml of doubly distilled water, which served as a solvent for our compound.
- 0.76128 gm of thiourea salt was added into the beaker containing water and stirred well.
- Similarly, 1.3628gm of $ZnCl_2$ was added into the beaker containing 10ml of doubly distilled water and stirred well.
- The two saturated solution was heated until the entire salt gets dissolved in the solution.
- Finally, the solution reached the saturated state with certain amount of solute.
- The saturated solution was allowed to cool. After that the solution was filtered with care. The two solutions were then poured in a clean beaker and covered using aluminum foil with some holes in it for evaporation to takes place. It should be kept on an undisturbed place.
- As days go on crystallization takes places and crystal keeps on growing on the bottom of the beaker and attain the maximum size until the solvent – get evaporated.
- Similar procedure was used for growing other two crystals.

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EXPERIMENTAL TECHNIQUES

Fourier Transform Infrared Spectroscopy

Fourier transform spectroscopy is a simple mathematical technique to resolve a complex wave into its frequency components. Fourier transform infrared (FTIR) has made the mid IR region more useful. Conventional spectroscopy called the frequency domain spectroscopy, records the changes in radiant power as a function of frequency. In the time domain spectroscopy, the changes in radiant power are recorded as a function of time. In the Fourier, transform of such systems is done by means of high – speed computers.

What information can FT-IR provide?

- It can identify unknown materials,
- It can determine the quality or consistency of a sample,
- It can determine the amount of components in a mixture.

UV-Vis Spectrophotometry

Spectrophotometers include promotion of electrons from the ground state to higher energy state. In the ground state, the spins of the electronics in each molecular orbital are essentially paired. In the higher state, if the spins of the electrons are paired then it is called an excited singlet state. The experimental technique used for UV studies is Scanning Double Beam Spectrophotometer.

Micro Hardness Studies

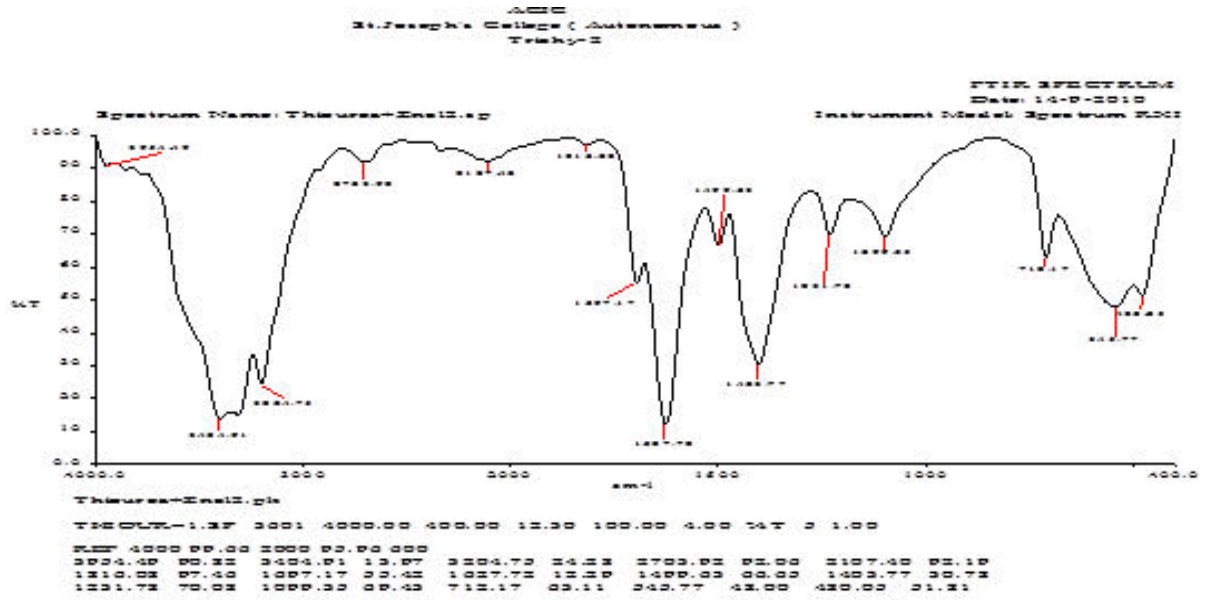
Hardness of the material is the resistance it offers to indentation by a much harder body. An important use of micro hardness studies is the possibility of mechanic indirect estimate of other mechanic characteristic of material having a specific correlation with their hardness.

The hardness depends not only on the properties of the materials under test but also largely on the conditions of measurements. Micro hardness tests have been applied to fine components of clock and instrument mechanisms, thin metal, strip, foils, wires, metallic fibers, thin galvanic coatings, artificial oxide films etc…, as well as the thin surface layers of metals which change their properties as a result of mechanical treatment (Machining), rolling, friction and other effects. The micro hardness method is widely used for studying the individual structural constituent elements of metallic alloys, minerals, glasses enamels and artificial abrasives. The mechanical property of crystal is studied using Vicker Micro Hardness Test.

RESULT ANALYSIS FROM GRAPHS

Infrared Spectroscopy

Figure-1: FTIR Spectrum for Thiourea + Zinc Chloride



Sources: Authors Compilation

Figure-2: FTIR Spectrum for Samarium Chloride

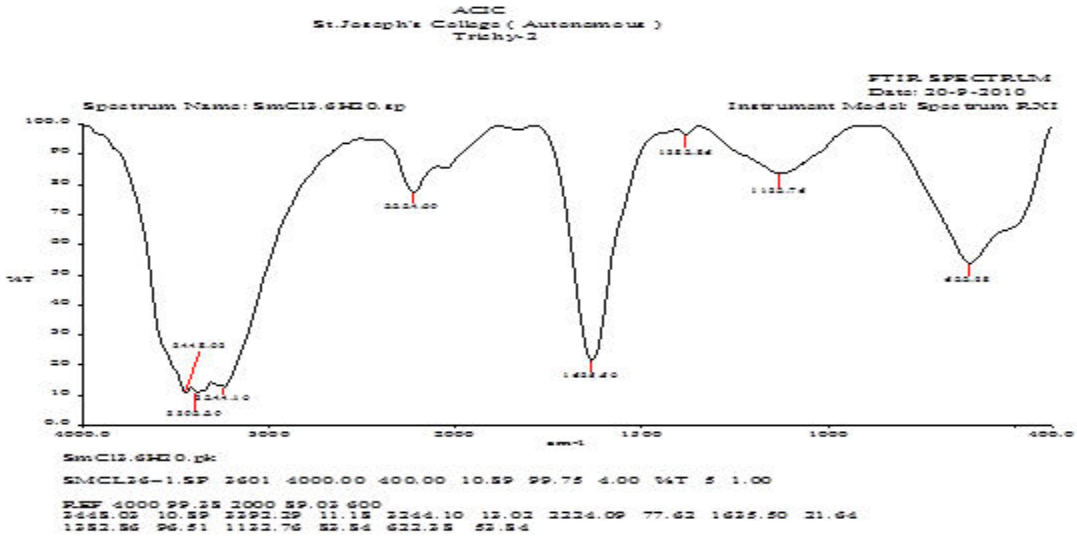


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Figure-3: UV for the Transmittance Value of Thiourea + $ZnCl_2$ and Semicarbaride Hydrochloride + $LiCl_2$

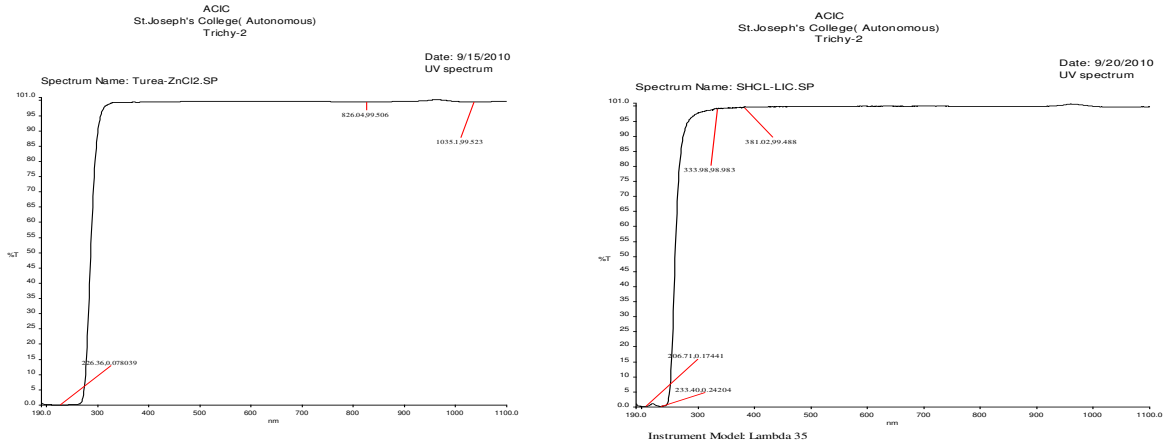

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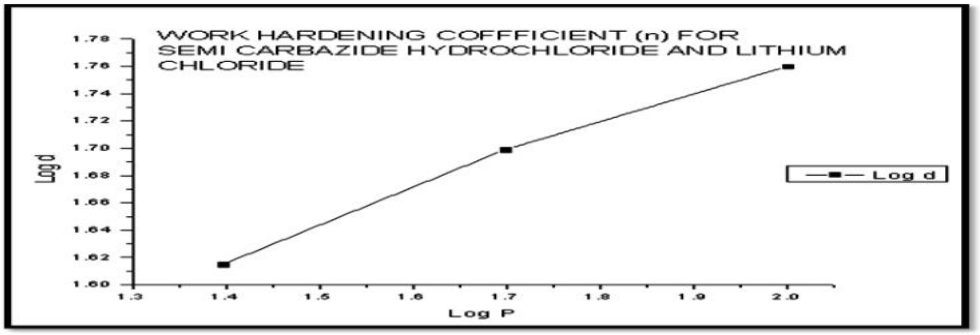
Figure-4: Microhardness Test for Semicarbazide Hydrochloride + Lithium Chloride

S. No	p X 10^{-3}Kg	d X 10^{-3} mm	Log P	Log d	HV = 1.8544 X P/d^2 Kg/mm^2
1	25	41.2475	1.307	1.615	27.2488
2	50	50.0475	1.698	1.699	37.0176
3	100	57.6025	2.00	17.60	55.888

Sources: Authors Compilation

Figure-5



Slope = 0.27906
n=1/Slope=3.5833

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CONCLUSIONS

In this project, the Infrared spectral band and UV spectrum were taken for Thiourea +$ZnCl_2$, Semicarbazide hydrochloride +$LiCl_2$ and Samarium chloride. Micro hardness study was made for Semicarbazide hydrochloride +$LiCl_2$.Crystal plays a vital role in biological applications. Solution growth method is used in this project to grow good crystals. Solution growth is a simple economical and versatile method used by many researches in establishing the crystal growth process. In IR spectral bands of SC $(NH_2)_2$ +$ZnCl_2$ the wave numbers for their functional groups were changed slightly from their original position, that mean there is the interaction between the two combined substances. But in CH_6ClN_3O +$LiCl_2$ the wave number for their functional group were not changed from their original position, that means there was no interaction between the two combined substances. The FTIR Spectrum confirmed the functional groups. UV-visible spectrum studies show that the crystal has good transparency. Micro hardness measurement suggests that Semicarbazide hydrochloride+$LiCl_2$ crystal is hard.

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SHIFT ODD-EVEN BUS INVERT CODING FOR LOW-POWER I/O

G. Kalyan Chakravarthy[26] K. Satya Sree[27] A. Vijaya Lakshmi[28]

ABSTRACT

In CMOS circuits, one major source of global power dissipation is dynamic power due to switching activity on buses. I/O busses due to the presence of high nodal capacitances dissipate much of the power in an IC. In this paper, the authors propose an algorithm that minimizes the transition activity on I/O busses. The performance of this algorithm has been tested on various benchmarks and it is found that, on an average, a reduction of 30% in power consumption is achieved, with respect to the unencoded bus.

Further, the proposed method achieves an energy saving of twice that of Bus-Invert method proposed earlier. The hardware for encoding/decoding of data by SOEBiC method has been designed using Synapsis Tools and power dissipated by the codec has been taken into consideration while calculating overall power dissipation.

KEYWORDS

Low-Power, I/O Bus, Coding, Global Power etc.

INTRODUCTION

In CMOS circuits, the charging and discharging of node capacitances is one main source of power dissipation. This is a major reason that most of the techniques attempt to reduce power dissipation by minimizing the transition activity [1]. In this paper, the authors focus on minimizing the transitions on the I/O busses that are usually associated with high capacitances.

Several coding techniques have been proposed earlier that seek to reduce transition activity on I/O buses [1, 2, 3, 4, 5, and 6]. One of the effective coding techniques to reduce switching activity is the bus-invert technique [2] in which the data bus is conditionally inverted to reduce the overall transitions. If more than 50% of the bits change, the entire bus is inverted. Therefore, in addition to the data, an extra bit must be transmitted to indicate if the bus is inverted. In this paper, the authors propose an encoding scheme, SOEBiC, which seeks to improve the efficiency beyond the known bus coding techniques.

The paper is organized as follows: Section 2 does the problem formulation while the energy model used to estimate the energy dissipation in busses is described in Section 3. The hardware Implementation is shown in Section 4, While Section 5 illustrates the algorithm with an example, and Section 6 provides results and discussion.

PROBLEM FORMULATION

In any CMOS circuit, four sources of power dissipation can be identified and the overall power dissipation can be written as: [8]

$$P_{Dissipation} = P_{Static} + P_{Dynamic} + P_{Leakage} + P_{Short\text{-}ckt} \quad (1)$$

In this paper, the authors focus on reducing the dynamic power dissipation at the I/O nodes through an encoding technique explained later. The dynamic power dissipation in a CMOS circuit is given by:

$$P_{Dynamic} = \lambda V_{DD}^2 C_L f \quad (2)$$

Where λ is the transition activity factor V_{DD}, is the supply voltage, C_L is the load capacitance and f is the frequency of operation. From the equation (2), it is evident that in order to reduce the overall power dissipation in the circuit, contribution from one or more of the terms on the right hand side of the equation must be reduced. This paper focuses on reducing the bus transition activity factor λ by using a new coding technique, called SOEBiC. λ can be written as:

$$\lambda = \lambda_S C_S + \lambda_L C_L \quad (3)$$

Where λ_S is the self transition activity factor which arises from the changes in a particular bus line, C_S is the self capacitance, i.e., the capacitance between the bus wire and the ground, λ_C is the coupling transition activity factor which arises due to the difference in bits carried by adjacent bus lines and C_C is the coupling capacitance, i.e., the capacitance between two adjacent bus wires.

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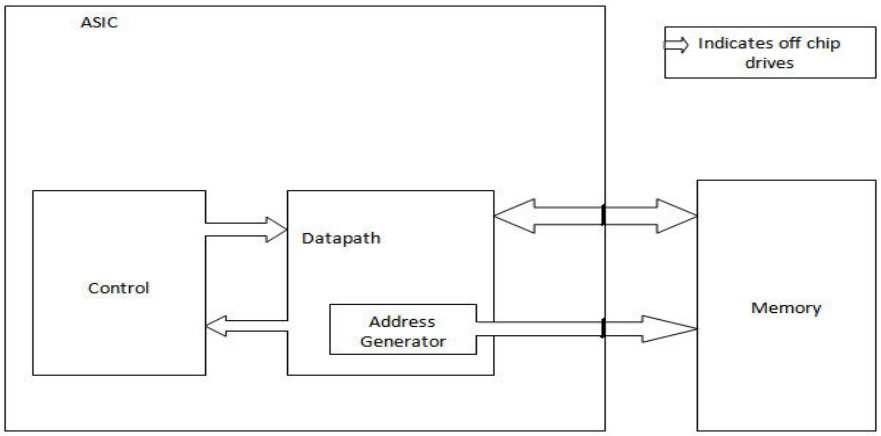
Figure 1 depicts a generalized architecture of a processor where transition activity is most dominant in the address and data buses. The capacitance of off-chip buses is high which leads to large power dissipation. The proposed technique focuses on minimizing the transition activity on these off-chip data buses.

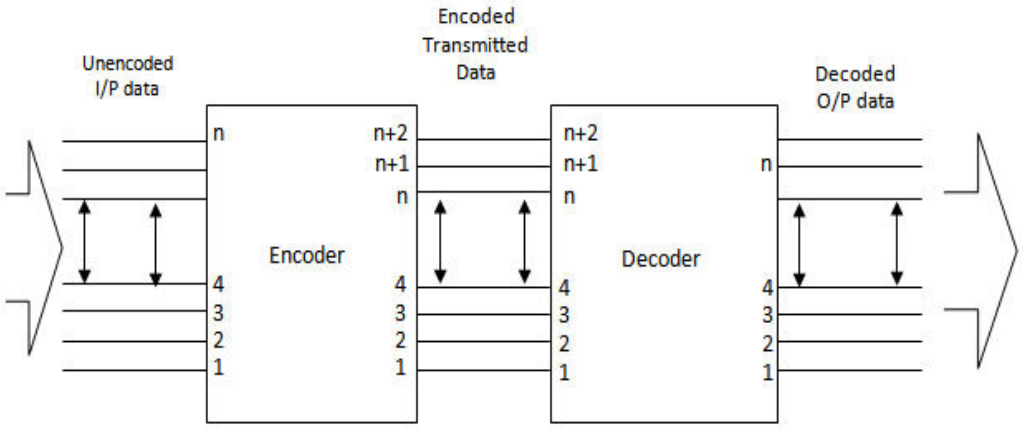
Figure-1: Generalized Block Diagram for a Processor



Sources: Authors Compilation

Figure2 shows the generalized block diagram for SOEBiC. There are 'n' unencoded input data lines, which are encoded into 'n+2' bits, by a coder block, which uses SOEBiC. At the receiving end, there is a decoder block, which decodes the transmitted 'n+2' bit data, back to the original 'n' bit data.

Figure-2: Block Diagram for SOEBiC



Sources: Authors Compilation

The details of the coding and decoding schemes of SOEBiC are dealt with in the following sections.

ENERGY MODEL

The equation for calculating the total energy dissipation is given by Eq. (4) [1, 4]. Equations (4) and (5) describe the energy dissipation due to self transition (E_r^L)and coupling transitions (E_j^I)respectively .The subscript represents the node number and the superscript represents the initial or final value of voltage on the interconnect at that node. For example V_{j+1}^frepresents the final value of voltage at *(j+1)th* node. λ in Eq. (4) represents the technology parameter, which is given byEq. (7). The significance of λ is that the value becomes high when the technology shrinks.

$$E = \sum_{r=1}^{N} E_i^L + \lambda \sum_{r=1}^{N-1} E_r^I \quad (4)$$

Where

$$E_i^L = C_L V_r^f (V_r^f - V_r^i) \quad (5)$$

$$E_j^I = C_L (V_{j+1}^f - V_j^f)^2 + (V_{j+1}^f - V_j^f)(V_{j+1}^i - V_j^i) \quad (6)$$

$$\lambda = \frac{C_L}{C_I} \quad (7)$$

The normalized energy dissipation on a 2-bit wide bus using the above equations is shown in Table-1.

Table-1: Energy Dissipation of a Two Bit Wide Bus

		(V_1^f, V_2^f)			
		00	**01**	**10**	**11**
(V_1^i, V_2^i)	**00**	0	1+λ	1+λ	2
	01	0	0	1+2λ	1
	10	0	1+2λ	0	1
	11	0	λ	λ	0

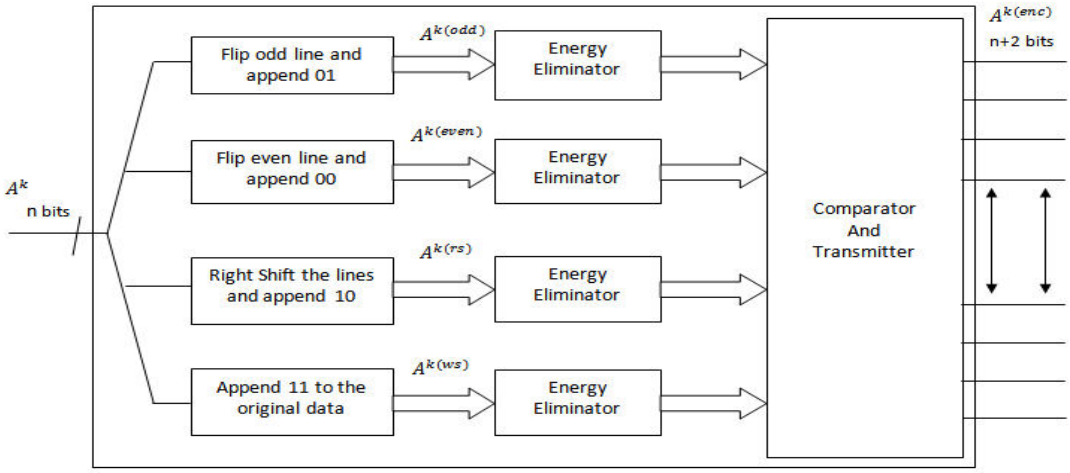
Sources: Authors Compilation

Let $A_n = \{a_{n-1}, a_{n-2}, \ldots . a_1, a_0\}$be the binary data of width *N* applied on the bus (for *N* interconnects in parallel). The data at any time instance 'k' on a bus of 'n' bit wide is represented as $A^k = \{A^k_{n-1}, A^k_{n-2}, \ldots A^k_1, A^k_0\}$. The data transmitted on the bus is represented as $E^k$where the width of the data transmitted is represented as *N'*. Thus, $E^k = \{C(A_n), I\}$, where $C(A_n)$represents the coded data and *I* represents the extra bits added to decode. For example in Bus Invert method *N'=N*+1 thus an extra bit is transmitted for decoding. The extra bit(s) added varies across various coding techniques. In proposed technique, only two extra bits are appended to the data to be transmitted.

HARDWARE IMPLEMENTATION

The block diagram of the proposed encoder is shown in Fig. 3. The encoder takes n bits as input, which is passed through 4 blocks after appending the appropriate 2 bits for decoding purpose. The energy dissipated is estimated as in steps 1, 2, 3 and 4 as shown in the algorithm above. The values of ST_ODD, ST_EVE, ST_RS, and ST_UN are calculated and the minimum value is found out. The encoded data, which corresponds to the least value of self-transitions, is then transmitted.

Figure-3: Block Diagram of the SOEBiC Encoder



Sources: Authors Compilation

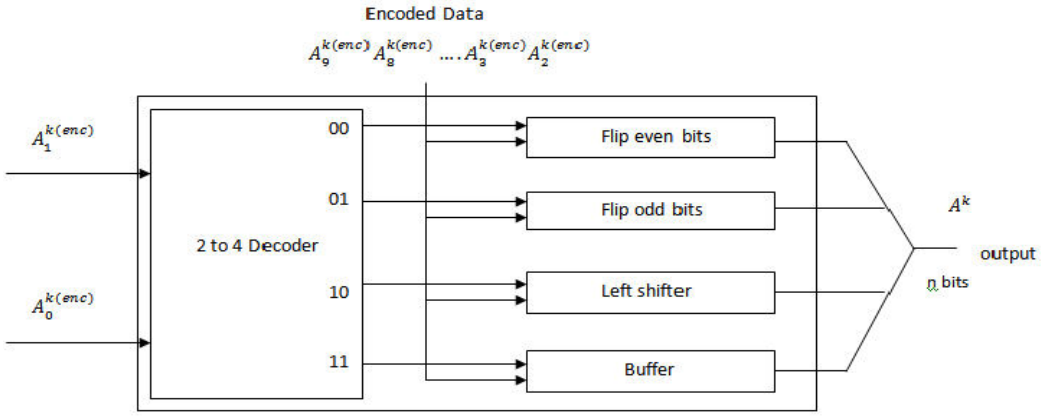
At the decoding end, shown in Fig. 4, the pattern in the 2 least significant bits is compared with 00,01,10,11 and the appropriate action is taken, as shown in Table 2.

Table-2: Bit Pattern v/s Action on the Encoded Data

Bit Pattern	Action on the n Most Significant Bits in the Encoded Data
00	The bits at the even positions are flipped
01	The bits at the odd positions are flipped
10	A cyclic left shift operation is performed on the n bits
11	The n bits are directly taken as the output.

Sources: Authors Compilation

Figure-4: Block Diagram of SOEBiC Decoder



Sources: Authors Compilation

ILLUSTRATION OF THE PROPOSED CODING SCHEME

Example 1

Let the coded data on the bus at time k-1 be$A^{(k-1)enc}$ = {↑↑↓↑↑↓↓↑↓↓} and let A^k = {↓↑↑↓↓↑↑↓}be the current data that should be transmitted after encoding. In this case Number of transitions without coding = 5 and with coding is given by,

$A^{k(odd)}$ = {↑↑↓↓↑↑↓↓↓↑} with ST_ODD = 4
$A^{k(eve)}$ = {↓↓↑↑↓↓↑↑↓↓} with ST_EVE = 5
$A^{k(rs)}$ = {↓↓↑↑↓↓↑↑↑↓} with ST_RS = 6
$A^{k(un)}$ = {↓↑↑↓↓↑↑↓↑↑} with ST_EN = 7

Since min (ST_ODD, ST_EVE, ST_RS, ST_UN) =ST_ODD=4, $A^{k(odd)}$ is transmitted. Hence $A^{(k)enc} = A^{k(odd)}$and the number of transitions is reduced from 5 to 4 with respect to the transmission of unencoded data.

Example 2

Let us consider the worst case. Assume that the coded data on the bus at time k-1 be$A^{(k-1)enc}$ = {↑↓↑↓↑↓↑↓↑↑}and letA^k = {↓↑↓↑↓ ↑↓↑}be the current data that should be transmitted after encoding. In this case, Number of transitions without coding = 8 and with coding is given by,

$A^{k(rs)}$ = {↑↓↑↓↑↓↑↓↑↓} with ST_RS = 0
$A^{k(un)}$ = {↓↑↓↑↓↑↓↑↑↑} with ST_EN = 9
$A^{k(odd)}$ = {↑↑↑↑↑↑↑↓↑} with ST_ODD = 6
$A^{k(eve)}$ = {↓↓↓↓↓↓↓↓↓} with ST_EVE = 4

Since min (ST_ODD, ST_EVE, ST_RS, ST_UN) =ST_ODD=0, $A^{k(rs)}$ is transmitted. Hence $A^{(k)enc} = A^{k(rs)}$and the number of transitions is reduced from 8 to 0 with respect to the transmission of unencoded data.

RESULTS AND DISCUSSIONS

The efficiency of various coding schemes proposed earlier has been compared with the current scheme (SOEBiC). The power dissipation of these coding schemes have been evaluated by using three sets of 50,000 random vectors, each of 8, 16 and 32 bits width. The results obtained are tabulated in Table 3. Power saved expressed as percentage is calculated by Eq. (8)

$$\%Powersaving = \left(\frac{P_{un} - P_{Coded}}{P_{un}}\right) \times 100$$

Where P_{un}represents the power dissipation due to unencoded bit stream of data and P_{Coded} represents the power dissipation due to the coding of bit stream. It is inferred from Table 3 that the power saving due to SOEBiC with respect to unencoded is on an average about 30%. It can be seen from the table that the efficiency achieved by SOEBiC is higher than other methods proposed earlier. The proposed coding technique has also been tested using SPEC'95 benchmarks and the results are shown in Table 4. The power saving is more than that obtained with other coding techniques reported in literature [1, 2, 3, 4, 5, 6].

Table-3: Performance of SOEBiC on SPEC'95 benchmarks

Benchmark	Power Saved
compress	29.32%
go	32.11%
gcc	30.26%
vortex	28.56%
mpeg	30%

Sources: Authors Compilation

Any coding technique should consider power dissipation due to coding/decoding hardware (CODEC) also in order to estimate true saving in power. Thus, the true total powerP_{true}, saved is given by Eq. (9), where $P_S$is the power saved due to encoding technique and $P_{Codec}$is the power dissipated by the Codec relative to the un-encoded bus.

$$P_{true} = P_S - P_{Codec} \quad (9)$$

Table-4: Comparison of SOEBiC with Other Coding Schemes for Power Dissipated (Expressed as a percentage) for 8-, 16- and 32-bit Data Buses

Bus Coding Method	Set 1			Set 2			Set 3		
	8 bit	16 bit	32 bit	8 bit	16 bit	32 bit	8 bit	16 bit	32 bit
UC	100	100	100	100	100	100	100	100	100
BI	84	86	88.25	84.56	85.5	88	83	84	85
NBED	91.5	90	91	89.9	90.5	92	90	90.12	90.32
BR	90.5	90	90.25	91	91.12	91	90.21	89.93	91.26
SHIV	80	81.12	82.32	82	82.21	81.44	81.35	81	82.31
OE-BI	74	75	78.32	74.65	74	79.22	75.25	75	78.45
LWC	79.5	80	80.55	80.12	79	81.32	80.3	79.11	79
OEG	89	90	90.52	90.5	89.32	89.56	89	90.5	90
SOEBiC	68	69.66	71.32	69	68.12	69.91	68	70.25	69.21
NBC	76.5	77.35	76.81	76	79.21	81	77.32	80.32	81.11
EPC	78.12	79.22	80.12	79.33	78.65	80.19	79.65	80.65	81

Sources: Authors Compilation

Note: LWC-Limited Weight Coding [7] UC-Un-encoded OEG-Odd Even Grouping
OE-BI-Odd Even Bus Invert [6] BI-Bus Invert [2] SHIV-Shift Invert Method [5]
NBED-Novel Bus Encoding-Decoding [3] BR-Bit Reversal [11] NBC-Novel Bus Coding Method [9]
EPC-Efficient Power Reduction Technique [10]

Since power dissipation due to codec has not been considered by earlier, coding techniques, the authors for a few select coding techniques have designed codecs and the true power saved has been estimated using Eq. (9). The results are illustrated in Table 4. It can be easily seen from the table that the power saved using SOEBiC is higher than other methods. It is interesting to note that negative power obtained for NBED technique actually indicates that the power dissipated by the codec circuitry is more than the power saved by the coding technique alone! From Table 4, it is observed that SOEBiC performs much better compared to any other coding schemes proposed earlier.

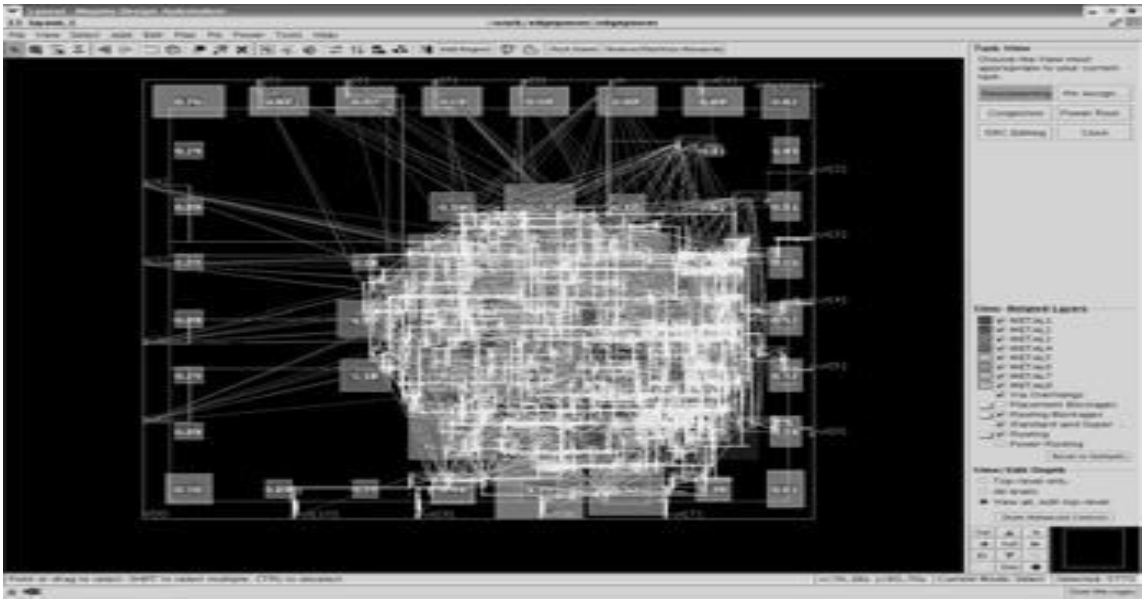
Table-5: True Power Saved Expressed as a Percentage

Bus Coding Technique	% Total Power	Bus Coding Technique	% Total Power
OE-BI	21.74%	BI	12%
LWC	14.58%	NBED	-3.50%
BR	5.25%	OEG	0.66%
NBC	18.65%	SHIV	15.81%
EPC	16.25%	**SOEBiC**	**24.04%**

Sources: Authors Compilation

SOEBiC Encoder has been designed using Synapsis tools and it is shown in Figure 5

Figure-5: Layout of SOEBiC Encoder



Sources: Authors Compilation

CONCLUSIONS

A new bus-encoding scheme, *SOEBiC* has been proposed which reduces the power consumption at I/O buses by as much as 30%. It has been found that power saved by SOEBiC is higher than other methods proposed in literature when applied to random data. In particular, this technique results in twice the power saving compared to Bus Invert method. In addition, the true power saving due to the proposed technique, taking in to account power dissipated by the codec, is highest among all coding techniques.

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SECURITY OF ENTERPRISE RESOURCE PLANNING SYSTEMS IN ORGANIZATIONS

Meeta Joshi[29]

ABSTRACT

Information technology is revolutionizing the way that changing all aspects of business organization. An enterprise is a group of people with a common goal, which has certain resources at its disposal to achieve that goal. Enterprise resource planning is a method of effective planning of all the resources in an organization. ERP now is experiencing the transformation that will make it highly integrated, more intelligent, more collaborative, web-enabled, and even wireless. It has been observed that ERP system with high vulnerability and high confidentiality in which the security is critical for it to operate. Security is one of the most important issues for an organization. In classical business operation, just as governmental and military operations, there have long been security issues concerned with physical protection. While in an open environment, we need new technical approaches to secure an ERP system. This paper introduces security solution in ERP as well as a direction to use secure ERP systems.

KEYWORDS

Authorization Information Security, Enterprise Resource Planning, WSDL, RBAC, CORBA etc.

INTRODUCTION

An ERP system is an integrated, configurable, and tailors able information system, which plans and manages all the resources and their use in the enterprise, and streamlines and incorporates the business processes within and across the functional or technical boundaries in the organization. An Enterprise Resource Planning (ERP) system is multi-module transaction-based application software that helps organizations to manage the vital parts of the business.

ERP systems have access control security, which provides control over WHO can access WHAT data. A usage policy defines:

WHO can use the information i.e. people / groups within or outside of the enterprise,
WHAT can each person do with the information i.e. read / edit / print / distribute / copy,
WHEN can each person access the information i.e. within certain dates, within a time span?
WHERE can the information are accessed from i.e. specific computers, within the office.

These controls unfortunately do not extend to the same data once it is downloaded from the ERP system. The ERP systems' security is limited until the time the information is within the system. Once the information leaves the ERP systems in the form of reports and comes to desktops, laptops or mobile devices, then the ERP system's security policies are not effective on the information.

The objective of this paper is to give an overview of the state of the art in ERP technology and the security issues for an ERP system. In particular, the organization of this paper is as follows. The history and evolution of ERP systems will be given in the next section. This section also includes a discussion of the ERP architecture, some aspects of SAP, and the emerging web services for ERP. The other sections are based on security in ERP in which we discuss the need of security and the problems, which can be faced without any security system in an enterprise. At the end In particular, the overview of the ERP security using a layered approach, as well as the RBAC model for ERP is discussed.

HISTORY AND ARCHITECTURE OF ERP SYSTEMS

ERP systems are now ubiquitous in large businesses and the current move by vendors is to repackage them for small to medium enterprises (SMEs).The history of ERP traces back to the 1960s, most organizations designed, developed and implemented centralized computing systems, mostly automating their inventory control systems using inventory control packages (IC).Firstly .Material requirements planning (MRP) systems were developed in the 1970s which involved mainly planning the product or parts requirements according to the master production schedule. Following this route new software systems called manufacturing resources planning (MRP II) were introduced in the 1980s with an emphasis on optimizing manufacturing processes by synchronizing the materials with production requirements. MRP II included areas such as shop floor and distribution management, project management, finance, human resource and engineering. ERP systems first appeared in the late 1980s and the beginning of the 1990s with the power of enterprise-wide inter-functional coordination and integration. Based on the technological foundations of MRP and MRP II, ERP systems integrate business processes including manufacturing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, and transportation, providing accessibility, visibility and consistency across the enterprise.

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EVOLUTION OF ERP

Figure-1

Sources: Authors Compilation

ERP systems initially focused on automating back office functions that did not directly affect customers and public. Front office functions such as Customer Relationship Management (CRM) dealt directly with customers, or e–business systems such as e–commerce, e–government, e–telecom, and e–finance, or supplier relationship management became integrated later, when the Internet simplified communicating with external parties.

A typical ERP system should at least have the following features:

- **Componentized** different business functionalities are designed as different components.
- **Integrated** components are integrated and seamless data flow between components allows them to collaborate as a one function.
- **Real-time** the components work in real time, online, and batch processing modes should be available.
- **Profitable** system must have the potential to reduce the cost or increase profit, since these are a company's basic requirements and motivations.
- **Secured** security schema has to be enforced to protect various enterprise resources regardless whether it is appropriate or sufficient

The business logic in ERP system employs client/server architecture to create a distributed computing environment. Generally, the three-tier architecture will be used, which contains three layers of logic:

1. Presentation Layer (Front): A unified Graphical User Interface (GUI) or browser for data entry or accessing system functions that collects input, generates requests, and returns the results
2. Application Layer (Middle): Application programs that collect the requests from the Presentation layer and process the requests based on: Business rules, functions, logic, and programs acting on data received/transferred from the database servers.
3. Database Layer (Back): DBMS that manages the operational and business data throughout the whole enterprise and the user access to this information. This layer may also include the operating system and the related hardware.

SECURITY IN ERP

Security is critical for ERP systems, as they are used in numerous industries including defense, intelligence, medical, and financial. The balance between making data available to the users that need it and denying it from those who should not have access is not easy to achieve. To manage this risk your company needs to implement an appropriate access strategy. Consider the following security issues:

- Are you certain that sensitive information cannot be displayed to unintended users?
- Can the right people in your organization only perform critical functions?
- Does your ERP system give your users access to all the relevant information, to make the optimum decisions?
- Do your E-Commerce requirements have a security plan developed?
- Are you confident that you have appropriate security and control over your data?
- Will you comply with external and internal audit requirements?
- Will you eliminate the disclosure of confidential information?
- How reliable is your network and ERP system

By seeing these issues we can say that security is an important aspect of any information system. In the next section, we will discuss the approaches, which can be used to develop secure ERP system.

GENERIC SECURITY FRAMEWORK

Given Figure3 shows a generic information security framework. The framework is divided into three components: people, technology and policy, which are interdependent. Any change to one of these components will affect the other two.

Figure-2

Sources: Authors Compilation

People Component

The people component is divided into two groups. The first group comprises people who put security in place and support the process such as IT administrators and auditors. The second group is the actual users of the systems. They must be aware of the reasons why security is in place as well as the consequences

According to Martins[1], the people component can be divided into nine aspects:

- **Policy and Procedures**

  The information security policy dictates employee behavior and states what is expected of employees, which in time becomes part of the information security culture.

- **Benchmarking**

  Guidelines on information security processes can be promoted in the organization through benchmarking. This will enable the organization to compare itself to other similar organizations and to international standards.

- **Risk Analysis**

  Through risk analysis, threats to organizational assets and security measures can be identified to develop the information security policy.

- **Budget**

  A financial plan is necessary to implement the issues concerning an information security culture.

- **Management**

  Management is responsible for information security. Management develops an organization's vision and strategy, which are required to protect information assets and which are implemented in the organization.

- **Trust**

  Information security is important in instilling trust in an IT environment. It is easier to implement new procedures and guide employees through changes of behavior regarding information security if management and employees trust one another.

- **Awareness**

  Since the effectiveness of information security controls depends on the people who are implementing and using them, employees need to be enabled through awareness and training to behave according to what is expected of them to ensure the security of information assets.

- **Ethical Conduct**

  Good practices form part of the culture established throughout the organization.

- **Change**

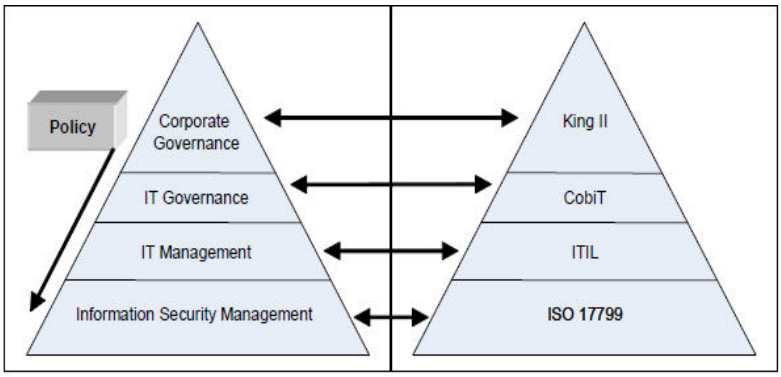
  Technology changes involve challenges to ensure secure communication and secure use.

These nine aspects form the basis of the people component and are comprehensive enough to address all people related issues within an ERP system.

Policy Component

Information security is a key aspect of information technology governance[2]. Various methods are available to an organization to make information security part of corporate governance such as international standards that include CobiT, ITIL and ISO 17799. Given Figure 3 illustrates the breakdown of the policy component as guided by corporate governance requirements into the three levels of IT governance, IT management and information security management, supported by CobiT, ITIL and ISO 17799, respectively.

Figure-3



Sources: Authors Compilation

King II

The King Report on Corporate Governance for South Africa 2002 is a corporate governance recommendation report published by the King Committee. It addresses the management accountability and responsibilities of organizations towards their shareholders.

CobiT

CobiT is an IT governance control framework and maturity model that ensures that IT resources are aligned with the organizational vision and strategies. CobiT does not, however, include control guidelines or practices, which are the next level of detail nor the process steps, and tasks because it is a control framework rather than a process framework. CobiT focuses on what organizations need to do, not how to do it.

ITIL

ITIL describes and defines key processes such as problem, change and configuration management. It also provides a framework for managing the processes

ISO 17799

A de facto international standard provides guidelines and recommendations for security management. ISO 17799 is divided into 10 modules that are used to implement security. King II states what must be done by the organization, CobiT states what must be done by IT.

Technology Component

The technology component of information security can be broken down into five pillars[3]:

- **Identification and Authentication**

  The first responsibility of information security within an ERP system is to ensure that the ERP system is only accessed by legitimate, authorized users[4].

- **Authorization**

  One of the most critical aspects to consider within ERP security is to restrict the access rights and actions of the users within the ERP system. Authority assigned to the user ID controls the access rights of a user.

- **Confidentiality**

  Protecting the confidentiality of data implies the assurance that only authorized people are able to view specific data sets.

- **Integrity**

  Integrity means that only authorized users can modify the data of the ERP system. Modification refers to the update, deletion and creating of data within the ERP system.

- **Non-Repudiation**

  The organization ensures that a transaction that is done is legitimate and can be proven as such in case of a query or dispute. Organizations can make use of digital signatures or public key encryption to enforce valid and legal transactions

APPROACHES TO SECURITY

Security problems exist in every facet of an ERP system. These facets can be classified into three categories: network layer, presentation layer, application layer. When a customer/partner communicates with an ERP system, or the business components located in different places interact with each other, the security Problems in these cases are classified into the network security domain. ERP experts will not deal with these cases directly, instead this function will be provided by purchasing from other vendors who are experts at **network security**.

The **presentation layer** refers to the graphical user interface, browsers, and PCs. Since the transmission of GUI packets is impossible to restrict, ERP experts cannot secure the system by limiting user access to GUI. The better way to provide security may be to place a CITRIX server between the user and the ERP.

The security in **application layer** invests large efforts of the ERP experts to offer an effective way to secure the business data and processes. The technicians will also choose to activate/deactivate the security functions provided by the database vendor according to the overall security solution.

CURRENT SOLUTIONS

Role-Based Access Control

Access is the ability to do something with a computer resource (e.g., use, change, or view). Access control is the means by which the ability is explicitly enabled or restricted in some way. With role-based access control, access decisions are based on the roles that individual users have as part of an organization.

Access rights are grouped by role name, and the use of resources is restricted to individuals authorized to assume the associated role. The use of roles to control access can be an effective means for developing and enforcing enterprise-specific security policies, and for streamlining the security management process.

Users and Roles

Under the RBAC framework, users are granted membership into roles based on their competencies and responsibilities in the organization. The operations that a user is permitted to perform are based on the user's role. This simplifies the administration and management of privileges; roles can be updated without updating the privileges for every user on an individual basis.

Roles and Role Hierarchies

Under RBAC, roles can have overlapping responsibilities and privileges; that is, users belonging to different roles may need to perform common operations. All employees may perform some general operations.

Role hierarchies are a natural way of organizing roles to reflect authority, responsibility, and competency: the role in which the user is gaining membership is not mutually exclusive with another role for which the user already possesses membership. These operations and roles can be subject to organizational policies or constraints. When operations overlap, hierarchies of roles can be established. Instead of instituting costly auditing to monitor access, organizations can put constraints on access through RBAC.

Roles and Operations

Organizations can establish the rules for the association of operations with roles. Operations can also be specified in a manner that can be used in the demonstration and enforcement of laws or regulations.

An operation represents a unit of control that can be referenced by an individual role, subject to regulatory constraints within the RBAC framework. An operation can be used to capture complex security-relevant details or constraints that cannot be determined by a simple mode of access.

An enterprise may also define an accounting supervisor role that is allowed to perform correction operations. These operations require read and write access to the same fields of a savings file as the teller. The RBAC framework provides administrators with the capability to regulate who can perform what actions, when, from where, in what order, and in some cases under what relational circumstances.

Advantages of RBAC

Role-based access control (RBAC) offers e-businesses a secure method for efficiently managing Web users. Benefits of an RBAC solution include:

- **Increased Security:** Users' profiles and privileges can be modified rapidly if delegated administrators manage them. Changing policies and updating user profiles in a timely manner can help maintain high levels of security.

- **Security of Complex Organizations:** RBAC provides the ability to model complex organizations through the creation of roles and the delegation of their administration. Changes can be made quickly as an organization and its security policies evolve.

- **Reduced Complexity:** Distributing administration to delegated administrators is a centralized method for managing large groups of users, thus reducing the complexity of the process.

- **Reduced Costs:** Administering Web authorization data is cumbersome and can create a long-term financial burden. By using delegated administrators, a company can outsource the workload to administrators within customer, supplier and partner organizations, ultimately reducing costs.

Status of Current RBAC Activities

Several organizations are experimenting with the inclusion of provisions for RBAC in open consensus specifications. RBAC is an integral part of the security models for Secure European System for Applications in a Multi-vendor Environment (SESAME) distributed system and the database language SQL3. In addition, the Object Management Group's (OMG) Common Object Request Broker Architecture (CORBA) Security specification uses RBAC as an example of an access control mechanism, which can be used, with the distributed Object Technology defined by the OMG. CSL has been developing and defining RBAC and its applicability cooperatively with industry, government, and academic partners. CSL is defining RBAC and its feasibility. The model given by Dr. Virgil Gligor and his associates at the University of Maryland and with the National Security Agency (NSA) to develop a formal reference model for RBAC to provide a safe, effective, and consistent mechanism for access control. This effort is also implementing RBAC on NSA's Synergy Platform, a secure platform based on the Mach Operating System. CSL is also developing a demonstration of RBAC use in healthcare. In conjunction with the Veterans Administration (VA), CSL is studying the applicability of RBAC to VA systems.

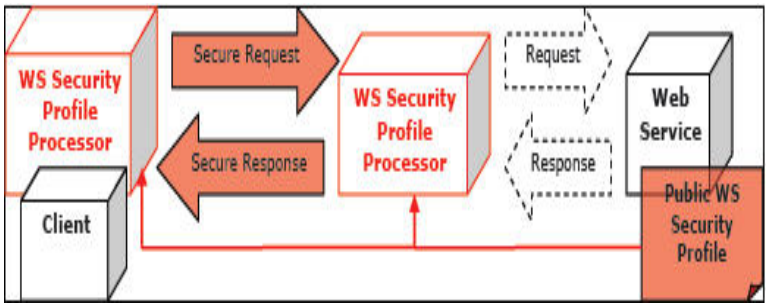
Directions on ERP Security

Security is an important aspect for an information system it can be implemented in two ways first at the time of developing the information system and second after the development of an information system. At the time of developing the ERP system, the developer implements security by using programming tools so that the proper authentication should be there for every user.

Example a unique user name and password system. Constructing a security layer and involving it into the already existing architecture, attention should be paid to the different specifications of individual security requirements. Within the shown context of a shared ERP system those requirements commonly correspond to message integrity, authenticity and data confidentiality of all interface calls and responses and thus of the whole network traffic.

As these strategic security objectives differ from each ERP peer to another, it is essential that the security model is open for virtually all security mechanisms and standards, which allows the processing of generic definitions of security profiles. Referring to the existing security mechanisms a security profile describes the concrete security requirements of the appropriate network node including the respective configuration parameters. A suitable profile processor is then able to audit all incoming messages for security conformance on the own security profile and to extend all outgoing messages according to the security policy of the remote peer. This process sequence can be seen by above figure 4.

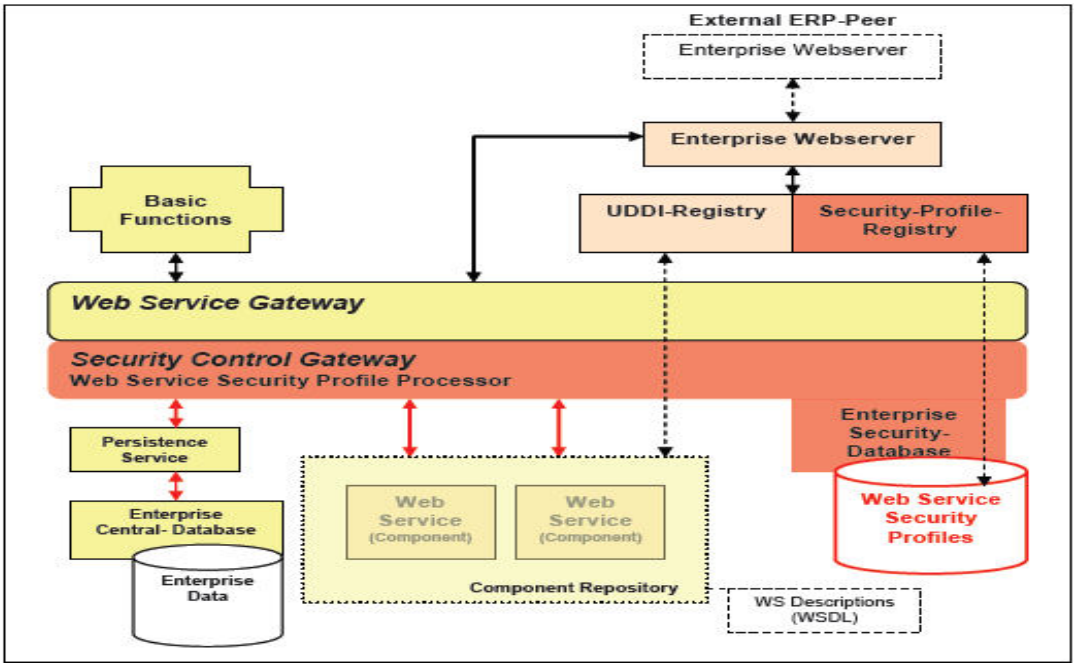
Figure-4



Sources: Authors Compilation

Similarly to the Web Service description (in WSDL) which is referenced by the „enterprise-own" UDDI registry, it is possible to ask for the related security profile and then to decide whether the remote guidelines are in accord with the security requirements of the potential caller and as result to communicate or not. Example parts of those descriptions can be XML encryption-, XML signature- or SAML-configuration parameters. A Web Service Security profile does not only include the security policy of a Web Service, but also a list of all supported security mechanisms or standards. Such properties that are related to the remote system security could for instance describe the existence of a trusted environment according to the Trusted Computing Group (TC) PC specification [TCG04] which in turn would offer more significant data confidentiality for non-public enterprise information. As visualized in given figure 5, the demands of the Web Service Security descriptions are processed and satisfied by a new security layer that we call security control gateway.

Figure-5



Sources: Authors Compilation

Policies

Much of the focus on ERP security has been on confidentiality. However, we need to include other types of policies. These include the following:

Need-to-Know Policies

These are policies where access is granted based on whether a user needs to know. These policies are enforced in military environments.

Need-to-Share Policies

There is now a migration from need-to-know to need-to-share policies in many organizations, including the military. Financial and healthcare operations also have to share data to carry out their operations.

Trust Policies

These policies ensure that data are shared only between individual organizations that are trusted.

Integrity Policies

These policies ensure that authorized individuals modify data. Furthermore, data quality and provenance policies that determine where the data have traveled and the accuracy of the data may also be included under the integrity policies.

Essentially an ERP system has to enforce the various policies. However, not all of these policies are needed for all applications. Therefore, one needs to examine the application, determine the policies that are relevant, and develop ways to enforce them.

CONCLUSIONS

The paper focuses on security of ERP system within an enterprise. ERP system now is going towards a system with more coordination/ collaboration, higher integrity, more intelligent, operating on the level of knowledge. The security issue within ERP has been there for a long time, but most of the solutions are based on the assumption that an ERP system is a closed environment.

This paper provides an enterprise with a framework to ensure that all aspects surrounding IT and corporate security are built into an ERP system. This paper includes the history and architecture of ERP system. It includes the need of security and the generic framework of security. In this paper, we have discussed the current solution of ERP security, which can be used in the enterprise.

In this paper, I have included the importance of security of ERP system. In future, I will try to find the solution to make more secure ERP system for an enterprise so that the information is can be moved freely in the enterprise but cannot be used by any unauthorized person.

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IMPACT OF INFORMATION ENCRYPTION, PROTECTION AND SECURITY ON USERS INTERACTIONS WITH FUNCTIONAL ELECTRONIC GOVERNANCE SYSTEM IN INDIA

Owais Charag[30] S. Mufeed Ahmad[31]

ABSTRACT

The Electronic Governance is one of the most important platforms, where interaction and action takes places in the modern times of today. However, the issue of security and protection of personal information limits and hinders the interaction frequency. Keeping in view government has put specialized systems in place to create a base where information security and information of personal identity is given prime importance. The framework includes back-ends (databases of different government agencies, service providers, state governments etc.), middleware and front- end delivery channels (home PCs, mobile phones, kiosks, integrated citizen service centers) for citizens and businesses. The middleware comprises of communication and security infrastructure, gateways and integrated services facilitating integration of inter-departmental services. The present research has been undertaken to evaluate and analyze the possibilities of breaches as witnessed by the users and the intensity of the information leaks within the present electronic governance based systems.

KEYWORDS

e–Governance, Information Encryption, Security, Data Protection, Electronic Transaction etc.

INTRODUCTION

Citizens' access to the government has been a key issue in the field of public administration. A number of hurdles impede citizens' access to policy processes, such as red tape, high transaction costs, and insufficient knowledge and information (Cooper, 1979; Kellogg and Mathur, 2003).

In this regard, recently emerging internet technologies have been expected to provide alternative ways for citizens to interact with public officials. A growing body of literature has focused on "e-government initiatives," which refer to the use of the Internet or web technologies to foster public service delivery and citizen participation in policy processes (Coursey and Norris, 2008; Dunleavy, et al., 2006; Norris and Moon, 2005; Robbins, et al., 2008; Thomas and Streib, 2005; Tolbert, et al., 2008; United Nations, 2008; West, 2005). Electronic governance uses information and communication technologies (ICT's) at various levels of the government and the public sector and beyond, for the purpose of enhancing governance (Bedi, Singh and Srivastava, 2001; Holmes, 2001; Okot- Uma, 2000).

According to Keohane and Nye (2000), "Governance implies the processes and institutions, both formal and informal, that guide and restrain the collective activities of a group. Government is the subset that acts with authority and creates formal obligations. Exclusively governments need not necessarily conduct governance. Private firms, associations of firms, non-governmental organizations (NGO's), and associations of NGO's all engage in it, often in association with governmental bodies, to create governance; sometimes without governmental authority." Clearly, this definition suggests that e-governance need not be limited to the public sector. It implies managing and administering policies and procedures in the private sector as well. Citizen's access to the government has been a key issue in the field of public administration. A number of hurdles impede citizens' access to policy processes, such as red tape, high transaction costs, and insufficient knowledge and information (Cooper, 1979; Kellogg and Mathur, 2003).

In this regard, recently emerging internet technologies have been expected to provide alternative ways for citizens to interact with public officials. A growing body of literature has focused on "e-government initiatives," which refer to the use of the Internet or web technologies to foster public service delivery and citizen participation in policy processes (Coursey and Norris, 2008; Dunleavy, et al., 2006; Norris and Moon, 2005; Robbins, et al., 2008; Thomas and Streib, 2005; Tolbert, et al., 2008; United Nations, 2008; West, 2005). The rise of internet technologies, however, has sparked an intense debate on the democratic potential of information and communication technologies (ICTs) (Norris, 2001).

Reinforcement theory argues that web technologies add to the political resources of the powerful elite or activists, strengthening their influence on policy processes (Davis, 1999; Weare, et al., 1999). By contrast, mobilization theory points out that new ICT's provide politically alienated citizens with alternative channels to represent their interests in policymaking processes (Scott, 2006; Stanley and Weare, 2004; Thomas and Streib, 2003).

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For instance, e-voting systems expand opportunities for citizens to make choices among policy options such that the systems empower them to be direct policy makers (Becker, 2001; Coleman and Gøtze, 2001). In addition, online forums hosted by the government help engage geographically dispersed citizens in policy debates and suggest their ideas to public officials for consideration in decision-making (Shulman, et al., 2003; Stanley and Weare, 2004). However, despite their democratic potential, e-voting or online policy forums make citizens passively express their preferences regarding agendas predetermined by the government (OECD, 2003).

One important issue in e-government studies is whether government Web technologies affect public sector performance. Although e-government initiatives have been credited as engines of governmental reform, empirical evidence is insufficient to determine their effects on public agency performance. Some researchers have recently assessed how agency web site s may help improve public service delivery, citizen participation, and trust in government (La Porte, Demchak, and de Jong 2002; Scott 2006; Tolbert and Mossberger 2006; West 2005). Nevertheless, not only are studies on the impact of e-government web sites very limited, but many of them are based mostly on speculative reasoning, rather than empirical analysis with rigorous methodologies (Musso, Weare, and Hale 2000; Norris and Moon 2005). Thus, it remains unclear as to whether e-Government initiatives make a substantive contribution to public sector performance (Moon 2002).

Government web sites and other internet-based applications can provide the public with access to information on public policies and administrative services. They can also expedite responses to requests for specific services. Such web-based channels as e-mail list serves, e-bulletin boards, video conferencing systems, and eforums can help citizens access policy information, engage in policy deliberation, and contact key decision makers (Brewer, Neubauer, and Ceiselhart 2006; Musso, Weare, and Hale 2000; Thomas and Streib 2005).

Weare, Musso, and Hale (1999) find evidence that Web site adoption by municipalities is conditioned by their existing social and demographic conditions such as socioeconomic status, social elite concentration, and information infrastructure in the local community. In these ways, ICT's may further empower the wealthy and the politically connected while further alienating the socially disadvantaged and indifferent citizens from policy-making processes (Norris 2001). Every second year the UN conducts an e-government survey that aims to indicate which governments are progressive pioneers in relation to e–government technology. The resulting publication receives substantial attention, both as a representation of how information and communication technology (ICT) is used for e-government, and as a way of acknowledging the Member States that perform well and thus promote good practices (Goodwin et.al., 2011).

"United Nations e-government Survey 2008" is used to test the significance of the proposed model's stages. With the advancement of ICT (Information and Communication Technology), the words like e – government and e-governance have come into prominence. In fact, both these terms are used synonymously although they are quite different and have differing audiences to cater to and different objectives to achieve (Website: Godse and Garg) But, for this study, both the words will be used interchangeably. "e-governance", meaning "electronic governance", has evolved as information-age model of governance that seeks to realize processes and structures for harnessing the potentialities of information and communication technologies (ICT's) at various levels of government and the public sector and beyond, for the purpose of enhancing good governance (Bedi et al, 2001; Holmes, 2001; Okot- Uma, 2000 in Saxena, 2005).

REVIEW OF LITERATURE

Electronic Governance is an emerging global phenomenon within public sector institutions and is a fast growing significant discipline within the field of public administration. It is the movement of governments online to deliver their services and programs and to provide government information. It further interacts with the citizen and all this is done electronically. This results in the formation of new relationships between the citizen and the state. E-governance differs from e-government: E-government constitutes the way public sector institutions utilize technology to apply Principles of public administration and conduct the business of government. It is government using new tools to enhance the delivery of existing services. On the other hand, e- governance includes the vision, strategies, planning, leadership and resources needed to carry this out it means the ways that political and social power are organized and utilized. The cyber-optimists believe that e-governance holds great promise for the delivery of many types of public services from housing and welfare benefits to community health care and the electronic submission of tax returns, reconnecting official bureaucrats with citizen/customers*.

The Internet can serve multiple functions: disseminating information about the operation of government as well as public services, facilitating public feedback mechanisms like emails to government agencies, enabling more direct participation into the decision making process including consultation exercises at local level, and providing direct support for the democratic process, such as the efficient administration of electoral registration or online voting†. There is widespread concern that the public has lost faith in the performance of the core institutions of representative government, and it is hoped that more open and transparent government and more efficient service delivery could help restore public confidence*. In developing societies, the Internet can potentially help with the multiple challenges facing the effective delivery and administration of basic government services such as health and education, especially given the global reach that the technology provides, connecting medical professionals, local officials and university teachers in Oslo, Cambridge and Geneva with those in Nepal, Bangalore, and Havana. E- governance makes information available on government operations and public services, facilitates public feedback or reaction and allows more direct participation by the ordinary citizen in decision-making [Heeks, 2001b; Norris, 2001].

The e-governance movement not only promises higher quality and better delivery of services and a greater realization of entitlements, it also claims to offer stronger bonds between public servants and citizens based on transparency and accountability [Heeks, 2001a]. Schware [2000] emphasizes that e- governance provides equal access to government and speedy and transparent responses from public servants. In addition, e- governance provides a wider opportunity for public servants to interact directly with the public in the process of receiving feedback from citizens and responding to their queries and complaints through electronic means. For Ghere and Young [1998], public agencies now have to justify their decisions based on feedback from the people and conduct their business in public. The main rationales behind opting for e- governance are that e- governance will reduce costs and delays in delivering services, expand citizens' access to public sector information, reinforce innovation in public agencies, increase transparency and public accountability, weaken authoritarian tendencies and strengthen civil society and democracy [Pardo, 2000; Heeks, 2001a; Norris, 2001].

However the cyber pessimists believe that the use of IT in governance may worsen inequality in access to government services due to the lack of an adequate infrastructure, unequal ownership of computers, language constraints, and so on [UNDP, 1999; Singh, 2000; Levine, 2001]. There is also a concern that e-governance may disempower citizens by individualizing them, eroding their common bonds and endangering their privacy [Ghere and Young, 1998; Wachbroit, 2001].

For the critics, instead of a citizen–administration relationship based on equality and accountability, e-governance may strengthen a top-down bureaucratic process by posting information about the structures and functions of public agencies and reinforcing the existing mode of interaction through documents and reports [Norris, 2001]. Moreover, it is argued that e-governance may not only increase the power of bureaucratic experts in relation to elected political leaders, it may also lead to the politicization of the overall bureaucracy. If the information-expert bureaucrats become too influential in relation to elected political representatives, it may undermine their accountability to these elected politicians. In other words, under e-governance, the nature of the relationship between politicians and public servants may have changed from one based on neutrality and accountability to one of a fused power structure with the dominance of bureaucrats empowered by information expertise.

In this regard, Daly [2000] makes a general observation that the use of the internet in governance has enhanced the dominance of nomenklatura over the state. In line with the common optimist picture of e-governance, it is pointed out that in India, compared to the previous citizen–administration relations characterized by bureaucratic rigidity, long delays, unnecessary complexity and public suffering, this relationship under e-governance is now characterized by higher speed, greater access, less cost and less public harassment [Pardo, 2000; Budhiraja, 2001].

An OECD study of e-governance, based on a series of interviews with information specialists, public officials and the policymaking community in eight post-industrial societies in 1996-7, found that digital technologies like email have had greater impact in the dissemination of information to senior decision-makers and policy elites, although even here traditional channels remained most popular, including press releases, official Gazettes and face-to-face meetings. The studies conducted by the Center for Electronic Governance at Indian Institute of Management, Ahmadabad, indicate that the governments are enthusiastic in adopting e-governance. There are many examples of e-governance projects, which have won international and national awards. However, any government services need to be re-engineered to benefit from the emerging ICTs. There is an inherent distrust in citizens on the service delivery mechanisms. This image needs to be improved with confidence building measures. Shackleton et al [2004] examined the current status of Australian local government electronic service delivery and explored the appropriateness of current e-Business maturity models for evaluating the progress local governments are making towards electronic service delivery. Their research involved an evaluation of local government websites and a detailed case study of one local council. The results indicate that apart from Web based information provision, little progress has been made in the transition to electronic service delivery in most areas of local government.

Wadia [2000] mentioned that in India, e-governance creates an avenue for its citizens to communicate with top political leaders and local ministers through such tools as video-conferencing, on line grievance channels and complaint cells. In her comparative studies based on the Inter-Parliamentary Union list, Norris [2001] observes that there are 98 countries in which the national parliaments have their own websites; of these, the most comprehensive ones are from Scandinavia, Western Europe and North America.

Moreover, she found that among the developing countries, the website of the Indian Parliament (alfa.nic.in) is quite comprehensive. It encompasses a list of basic information regarding the House of People (Lok Sabha) and the Council of States (Rajya Sabha). The menu includes such items as parliamentary activities, parliamentary committees, budget matters, national constitution, legislative acts, Prime Minister's office, web addresses of all ministries and states, bulletins and publications, economic surveys, citizen services, and profiles and speeches of parliamentary members. It also provides an option for citizens to send feedback and suggestions through email. The Prime Minister's Office also has a website, which provides information regarding his policy initiatives maintains an option for surveying opinion regarding current political issues and offers opportunities for the public to send queries and comments. These online sources of information and avenues for public expression are supposed to be more conducive to a stronger relationship between citizens and politicians.

Heeks [1998b] found that out of 400–500 software export firms in India, the top 20 firms were responsible for 70 percent of all exports. Geographically, most of the 558 Indian software company headquarters are located only in few large cities: 152 in Bangalore, 122 in Mumbai, 93 in Chennai, 86 in Delhi, 34 in Hyderabad, 27 in Calcutta, 22 in Pune, and remaining 22 in all other

cities. These unequal structures of IT resulting from policies pursued under e-governance, thus, imply greater economic and geographical divides in India.

NEED FOR PRESENT RESEARCH

The wide spread implantation of e-Government around the world has recently attracted the attention of academic researchers. Understanding e-Government development and exploring variables that affect e-Government development have become an important research topic. Researchers following e-Government development indicated, "e-Government has become an evolving and important research area in the Information Systems (IS) field. The idea of governments around the world declaring themselves as suppliers of services adopting a citizen-centered strategy in order to achieve social and economic development goals has recently caught the attention of numerous e-Government researchers. Many of those researchers suggest that governments, in general, assume that people demand e- Government services. In addition, governments tend to supply people with what governments think is important while neglecting people's actual needs. This however is creating a mismatch between the demand and the supply of e-Government.

RESEARCH OBJECTIVES

In light of the domain for research identified, following objectives have been set for the present study:

- To examine the necessary elements of an international legal framework for authenticating and protecting personal identity, risks, benefits, and costs and to know how are they distributed across stakeholders
- To evaluate the impact of security and encryption on the frequency and satisfaction of users with the electronic service delivery interfaces.

RESEARCH METHODOLOGY

Nationwide data on the impact of best practices of e – Governance on good governance was studied, which is already available with the institutions having a role in delivering electronic services to citizens. In order to collect random data from the target population, a self-administered questionnaire was considered the most appropriate primary survey instrument in this investigation. This was because it addressed the issue of reliability of information by reducing and eliminating differences in the way that the questions were asked (Cornford and Smithson, 1996) and facilitated the collection of data within a short period from the majority of respondents (Hall and Hall, 1996).

Overall, the questionnaire used in this research contained 25 questions. These questions were divided into two categories: (1) multiple choice questions addressing the social attributes (demographic variables) including age, gender, education, and income; and (2) Yes/No questions that asked whether the respondents were aware of the Government Gateway and if they had registered when accessing it. Close-ended multiple-choice questions were included in the questionnaire in order to obtain a high response rate. This was attributed to instances where respondents preferred to answer close-ended questions within the non-interactive, self-administered questionnaires (Fowler, 2002).

Prior to dissemination of the final questionnaire, a pilot study was conducted in order to: determine the response rate and learn of any discrepancies within the questions, which included determining whether the format of the questionnaire and questions were suitable. Additionally, the duration that completion of the questionnaire would require was also established. The pilot questionnaire was delivered by using electronic mail to randomly selected 300 participants in June 2010.

A total of 210 replies were obtained from the respondents within the specified duration. The majority of the respondents reported that the questionnaire was easily understood and required 10 to 15 minutes to complete. The majority of the respondents validated the content of the questionnaires, although minor changes based upon the responses were undertaken to the final design of the questionnaire and a final questionnaire was developed. Since there were no major changes required to incorporate in questionnaire, responses received from the pilot study were also included in the final analysis (Fowler, 2002).

Fowler (2002) has suggested that a prerequisite for determining a sample size should be an analysis plan. This research is a part of a larger study on impact of e–Governance system practices in India, therefore analysis of the entire study required performing principal component analysis (PCA), regression analysis, t-test and chi-square test. It has been suggested that in order to perform the aforementioned statistical analysis with rigour, the sample size should be above 300 (Stevens, 1996). Therefore, keeping the statistical analysis plan in mind it was decided that the total sample size should be large enough to obtain a minimum of 300 responses.

DATA ANALYSIS

The variable information encryption, protection and security represents depicts that the information available through online medium is, encrypted, protected and secure for the use of end – users. The same question was put forward to 725 respondents from three sectors and there perceived responses are mentioned in the Table1. figures from the table depicts that out 424 respondents from the State of Andhra Pradesh 34.0% disagree where as 21.2% totally disagree therefore the assessment depicts

that the information which is available through online medium is not encrypted, protected or secure. Whereas the agreement with the statement shows representation that out of 424 respondents, 21.5% agree and 10.6% totally agree with the statement. The cumulative disagreement with the statement is 55.2% for the 424 respondents from the state of Andhra Pradesh.

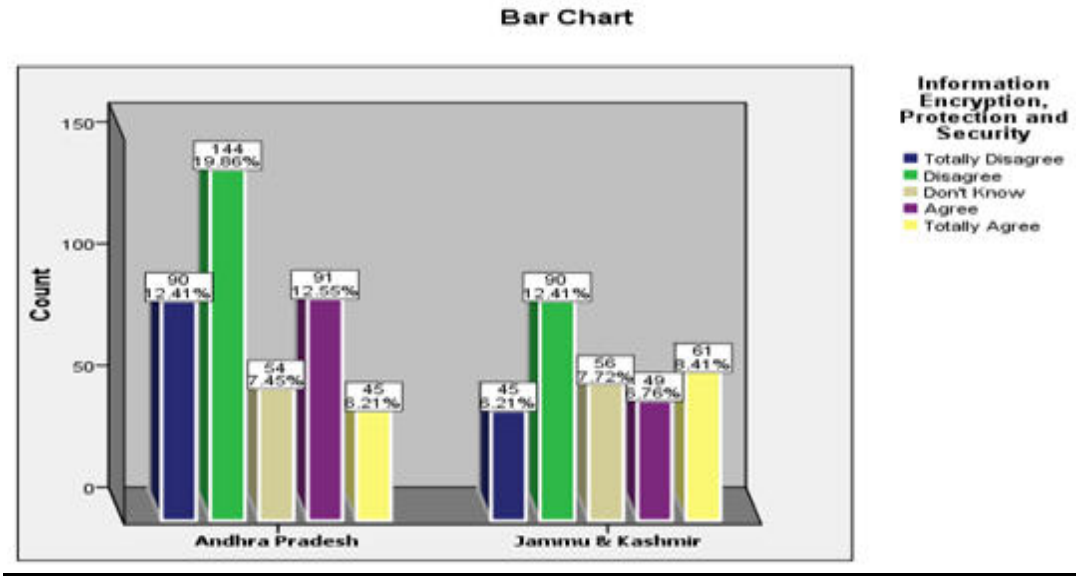
Table-1: State Wise Cross tabulation of Variable Information Encryption, Protection and Security

			Information Encryption, Protection and Security					
			Totally Disagree	Disagree	Don't Know	Agree	Totally Agree	Total
State	Andhra Pradesh	Count	90	144	54	91	45	424
		% within State	21.2%	34.0%	12.7%	21.5%	10.6%	100.0%
		% of Total	12.4%	19.9%	7.4%	12.6%	6.2%	58.5%
	Jammu & Kashmir	Count	45	90	56	49	61	301
		% within State	15.0%	29.9%	18.6%	16.3%	20.3%	100.0%
		% of Total	6.2%	12.4%	7.7%	6.8%	8.4%	41.5%
Total		Count	135	234	110	140	106	725
		% within State	18.6%	32.3%	15.2%	19.3%	14.6%	100.0%
		% of Total	18.6%	32.3%	15.2%	19.3%	14.6%	100.0%

Sources: Authors Compilation

The figures from respondents of state of Jammu & Kashmir depicts that 29.9% and 15.0% out of 301 respondents disagree and totally disagree, therefore putting the cumulative figure to 44.9% for the state of Jammu & Kashmir. The data reveals that most of the respondents from the state of Andhra Pradesh as well as Jammu & Kashmir perceive that the information available through the online medium by government agencies is not fully protected, encrypted or secure and hence have concern about use of it.

Graph-1



Sources: Authors Compilation

Taking note of level of agreement perceived by the respondents from the state of Andhra Pradesh is double as compared to Jammu & Kashmir.

The statistical figures for the state of Andhra Pradesh is 21.5% and 10.6% totally agree out of 424 respondents. Whereas out of total 725 12.6% agree and 6.2% disagree from the state of Andhra Pradesh. Whereas out of 725 respondents 19.9% agree and 12.4% totally agree. Therefore, the cumulative figure of agreement for overall 725 respondents is 32.3%. Table2 depicts the perceived representation by the total sample population of 725 respondents across the three sectors, namely government sector, private sector and other sector of employment.

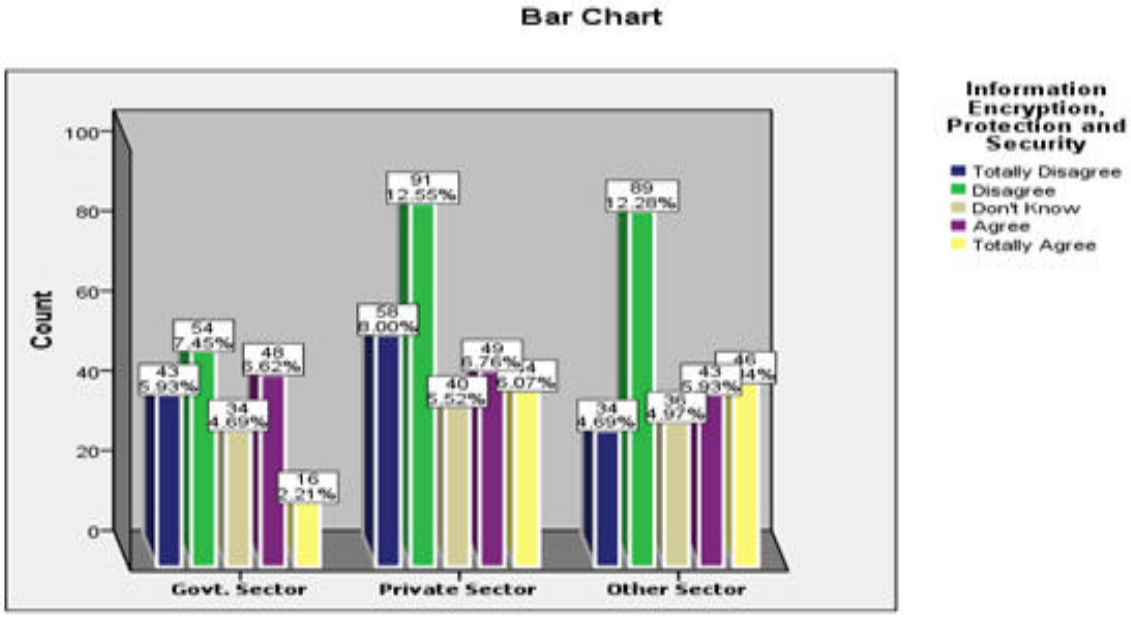
Table-2: Sector Wise Cross tabulation of Variable Information Encryption, Protection and Security

			Information Encryption, Protection and Security					
			Totally Disagree	Disagree	Don't Know	Agree	Totally Agree	Total
Sector	Govt. Sector	Count	43	54	34	48	16	195
		% within Sector	22.1%	27.7%	17.4%	24.6%	8.2%	100.0%
		% of Total	5.9%	7.4%	4.7%	6.6%	2.2%	26.9%
	Private Sector	Count	58	91	40	49	44	282
		% within Sector	20.6%	32.3%	14.2%	17.4%	15.6%	100.0%
		% of Total	8.0%	12.6%	5.5%	6.8%	6.1%	38.9%
	Other Sector	Count	34	89	36	43	46	248
		% within Sector	13.7%	35.9%	14.5%	17.3%	18.5%	100.0%
		% of Total	4.7%	12.3%	5.0%	5.9%	6.3%	34.2%
Total		Count	135	234	110	140	106	725
		% within Sector	18.6%	32.3%	15.2%	19.3%	14.6%	100.0%
		% of Total	18.6%	32.3%	15.2%	19.3%	14.6%	100.0%

Sources: Authors Compilation

Out of total of 195 respondents from government, sector 27.7% disagree and 22.1 % totally disagree that the information available through medium is protected, encrypted or secure. Where statistics from the private sector are reveals that out of 282 respondents out of 725 respondents, 32.3% disagrees and 20.6% totally disagree. Therefore, putting the cumulative to 52.9% of disagreement with the statement that information available through online medium is protected encrypted or secure.248 respondents from other sector out of total 725 respondents perceive 35.9% disagreement and 13.7% total disagreement; therefore the cumulative figure is 49.6%. From the above statistics we can derive that the overall percentage of the respondents disagree that the information available through the online medium if encrypted, protected or secure.

Graph-2



Sources: Authors Compilation

CONCLUSIONS

There are concerted efforts all over to make governments more efficient by reviewing and streamlining the key processes and by adding more value without the need to increase taxes. appreciation that a public sector organization could be more efficient and effective, if it were more like a private sector entity, using market-style strategies and even using incentives to drive public policies better. There are evidences of decentralizing the bureaucracy through empowerment of smaller agencies. There are also

felt needs that the potential conflict of intentions between policymaking and public service delivery should be eliminated. Slowly but steadily governments are shifting focus from processes and structures to outputs and outcomes, in order to become more accountable to citizens and the public.

Governments worldwide are under pressure to become more transparent, to remain sustainable over their initiatives and to avoid quick fixes and populist measures. There is a constant urge for inclusive development by way of providing development opportunities for all sections of society, especially benefiting rural and traditionally under-served communities. All these goals and objectives are driving the agenda for transformation and reform in the governments. It is the most interesting and fascinating fact that Information and Communication Technology (ICT) can effectively address in fulfilling all the above goals and objectives. It is now evident that ICT can overcome all the boundaries of society and penetrate all sectors of human activity.

Over the last few decades, it has proved to be the major driver of an improved quality of life, and specifically of the economic growth. There is a common argument that the ultimate impact of the ICT revolution would be far larger than the industrial revolution, the combustion engine and the telecommunication per se. Through singular adoption of ICT in all sectors of governance and society, it is now possible to march towards an inclusive information society.

The respondents reveal that there exists average to poor information security and data protection, while transacting with e – Governance system. The system of protection of personal information is not well designed and secure measures of interaction are not available, hence advanced users avoid using e–Governance system i.e. Tax Filing, Payment & Service Tax Payments, Complaint Registers and other services, which involves user for filing his/ her personal information and contacts.

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FPGA BASED HIGH LEVEL AND HIGH PERFORMANCE FFT PROCESSOR USING RADIX -2 PIPELINED

T. Ramaiah[32] P. Malyadri[33] Ch. Ravi Kumar[34]

ABSTRACT

The Fast Fourier Transform (FFT) is very important algorithm in signal processing. A Field Programmable Gate Array (FPGA) for Wireless Local Area Networks (WLAN) based on radix-2 pipelined FFT processor is proposed. In addition, a novel simple address-mapping scheme is proposed. Here the twiddle factors in our pipelined FFT processor can be accessed directly. The FFT processor has two pipelines, one is in the execution of complex multiplication of the butterfly unit, which read input data and the other is between the RAM modules, which store temporary variables of butterfly unit and output of the results. The processor has been developed using hardware description language VHDL on Xilinx with EDA Tools and the pipelined 64-point FFT processor can be implemented within only 67 clock cycles.

KEYWORDS

FPGA, Butterfly Unit, EDA Tools, FFT Processor, Twiddle Factors, Address Mapping Scheme etc.

INTRODUCTION

The FFT is one of the most commonly used digital signal-processing algorithms. Recently, FFT processor has been widely used in digital signal processing field applied for communication systems, spectrum measurements, image process, multimedia communication services, radar and WLAN. FFT processors used in wireless communication systems are execution time and lower power consumption. High-performance fast Fourier transform (FFT) processor is needed especially for real-time digital signal processing (DSP) applications. Here designing a fast FFT processor, an effectual FFT processor is needed for real-time operations for great significance. The pipelined hardware architectures are widely used, because they provide low latencies and high throughputs for real time and also a rationally power consumption and low area. From past two decades, FPGA has developed gradually and rapidly become general. The designs of FPGA have the advantages of more flexibility and high performance price ratio compared with designs of ASIC. So many researchers have studied on pipelined FFT based on FPGA. They proposed an approach to design an FFT processor for wireless applications, but their designs has too many clock cycles and is not fast enough. In comparison to their designs, we propose a simple feasible pipelined implementation of 32-bit 64-bit FFT processor for Wireless LAN based on Field Programmable Gate Array.

ALGORITHM, MULTIPLICATION & MAPPING SCHEME

A. Radix-2 FFT Algorithm

The Discrete Fourier Transform (DFT) plays an important role in the analyses, design and implementation of the discrete-time signal- processing algorithms and systems. It is used to convert the samples in time domain to frequency domain. The wide usage of DFT's in Digital Signal Processing applications is the motivation to implement FFT's. DFT is identical to samples of the Fourier transform at equally spaced frequencies. Consequently, computation of the N-point DFT corresponds to the computation of N samples of the Fourier transform at N equally spaced frequencies $\omega k = 2\Pi k/N$.

$$X(k) = \sum_{n=0}^{N-1} x(n) \cdot W_N^{nk}, k \in [0, N-1]$$

$$\text{Where} \quad W_N = e^{-j2\frac{\pi}{N}}$$

W_N is known as the (1/N)-th root twiddle factor. Consequently, we use the DIF algorithm to design radix-2 FFT module and most of current FFT processors are based on this algorithm.

B. Multiplication Method

It is indisputable that complex multiplication is the most important factor affecting the speed of FFT processor. For Computing, the complex multiplication requires two real adders and four real multipliers. Here the hardware area of a real multiplier is larger than that of a real adder in FPGA. Therefore, we have to do convert the complex multiplication into addition and subtraction to optimize the whole performance as high as possible. Having taken into account all operands are 32-bit complex numbers.

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The difference of two inputs Xm (i) and Xm (j) can be expressed by Z1= x1+jy1 and the twiddle factor WNnk = exp (2nNπ) can be expressed by Z2= x2+jy2. So the product of the two inputs also expressed by z=x+iy. The 16-bit real part x of the product is equivalent to x1 x2-y1y2 and the 16-bit imaginary part y is equivalent to x1 y2-x2y1. Therefore, we can transform the product z easily as the following equations:

$$x = x_1(x_2+y_2) - y_2(x_1+y_1)$$

&

$$y = x_1(x_2+y_2) - x_2(x_1-y_1)$$

Clearly, using this scheme, the system has some advantages. Here, the number of real multiplications is reduced from four to three. In addition, compare the addition, multiplication, has less consumption. Therefore, the power consumption of the system is also reduced. Finally, here, we can save 9-bit elements of 16 embedded multiplier in FPGA. Before they participate in the real multiplication the numerical values of x1+y1, x1-y1, x2+y2, x2 and y2 can be gotten in this 64-point FFT processor.

C. The Address Mapping Scheme for Novel system

Here, our system is 64 points block size. Considered the properties of radix-2 64-point FFT, to achieve a high-speed FFT, it was desires to read 8 operands from memories at a time. We know, these 8 operands in our design are located in different row or column of memory blocks and also this arrangement is obtaining that 8 conflict-free memory accesses can be performed. In addition, this is in parallel. At first, to store 64 operands in sequence we use eight 32-bit dual-port memories.

The linear shift conflict-free address-mapping scheme is adopted to change the addresses of operands. The primary two-dimensional addresses of operands will be mapped to new ones. For example, we assume the original 2-dimensional coordinate (a, b), in which they represents the address of the data in one memory and the number of the 8 memories, respectively. Then, we obtain a new conflict-free address (A, B) of the following equations:

A=b & B = (a+b)%8

ARCHITECTURE PIPELINED FFT PROCESSOR

The pipelined architecture is also an ideal method to implement high-speed long-size FFT owing to its regular structure and simple control. The performance of pipelined FFT processor can be improved by optimizing the structure and saving hardware resources. The pipelined architecture is also an ideal method to implement high-speed long-size FFT owing to its regular structure and simple control. The performance of pipelined FFT processor can be improved by saving hardware resources and optimizing the structure. The block diagram of our proposed FFT processor is illustrated in Fig.1.

It consists of four essential units. AGU, the abbreviation of address generator unit, produces 8 3-bit read addresses and write addresses. Control unit, the kernel of the FFT processor, harmonizes the whole system. Butterfly unit (BU), which has three-stage pipelined structure, carries out the complex multiplication. Two dual-port RAMs are used to store and output data.

Figure-1

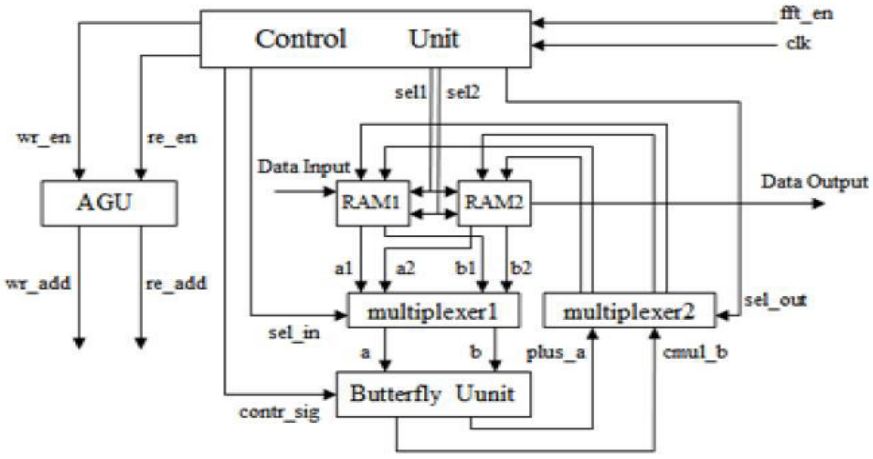


Figure 1. The pipelined FFT architecture.

Sources: Authors Compilation

AGU

The AGU is also quite important. It will create 8 read and 8 write addresses, which determine the data access to outer memories. In this FFT processor, to make it a more simplified and faster system, we adopt the in-place computation method. In addition, we write the results into where they are read. In contrast to the sequence of 64 input operands configured by address mapping, the final output sequence of the FFT processor are in bit-reversed order and need to be adjusted to normal order. In addition, we can make these appropriate adjustments before the FFT computation. Therefore, although we adjust the sequence of inputs or outputs, the performance of our FFT processor will not be degraded.

Control Unit

The main purpose of Control unit is to generate all control signals for the whole system, is responsible for operation control of the processor. The main purpose of Control unit is to generate all control signals for the whole system, is responsible for operation control of the processor. It generates sel1 and sel2 signals to select data from two RAMs, each of which is made up of 8 32-bit registers. The BU and the remaining parts are controlled by w_con as well. A 48-bit signal w_con controls the whole FFT processor. In addition, this signal w_con generates two parameters, write_en and read_en, to control AGU. This control unit harmonizes all steps of the FFT processor based on a 7-bit counter.

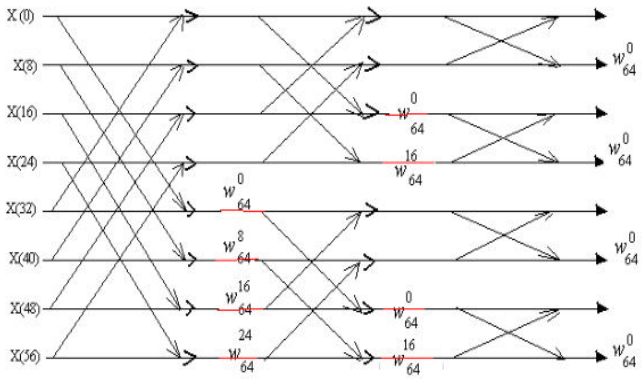
The RAM Unit

In this unit both the RAM1 and RAM2 are made up of 8 32-bit registers respectively. In addition, data is always written to the outside memories from RAM2, and it is always read to RAM1 from the outside memories. Then let us introduce the key algorithm used in this unit. Considering the properties of 64-point FFT, we can use the radix-2 DIF 8-point FFT as a whole unit, so there are only two stages to accomplish the 64-point FFT. In addition, these two stages are identical to the six stages of the standard radix-2 DIF 64-point FFT. System parallel reads 8 32-bit operands from outer memories to RAM1 at a time, and we need only read sixteen times. An example of this algorithm is shown in Fig.2.

The Butterfly Unit

In FFT algorithm, the Butterfly Unit is the central component; it is to calculate the sum and difference of two input data and plays an important role in computing the product of the difference and twiddle factors. To express all 32 factors that we need in this FFT processor owing to the fact that the twiddle factor W^{mk}_N can be separated into two components.

Figure-2: 8-Point FFT Radix-2 Example



Sources: Authors Compilation

Here, we have to use some factors. They are:

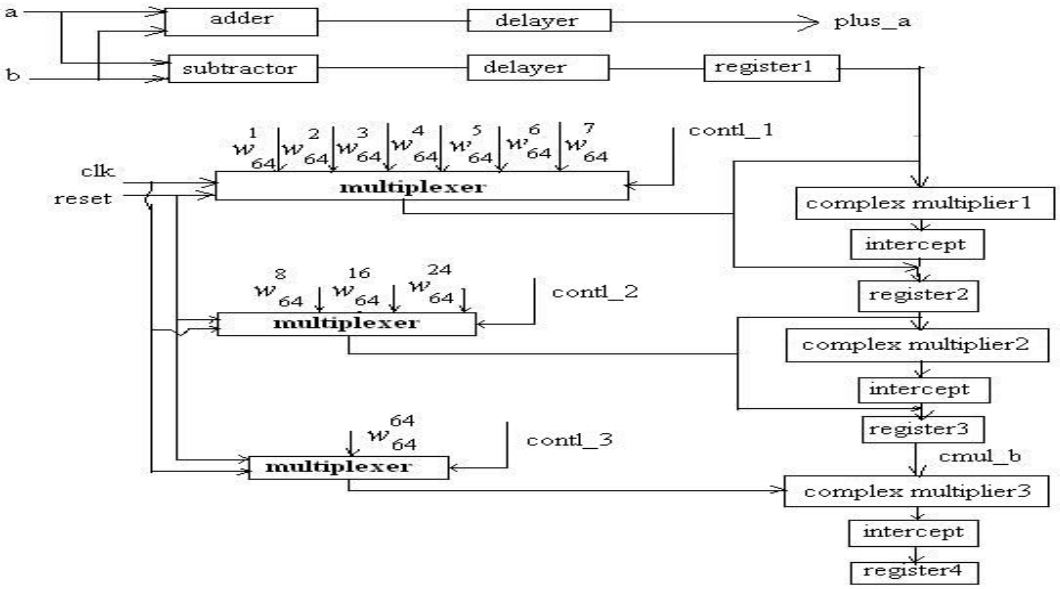
$$W_{64}^{0},\ W_{64}^{1},\ W_{64}^{2},\ W_{64}^{3},\ W_{64}^{4},\ W_{64}^{5},\ W_{64}^{6},$$

$$W_{64}^{7},\ W_{64}^{8},\ W_{64}^{16} \quad \text{and} \quad W_{64}^{24}$$

For instance, $W^{28}{}_{64}$ can be derived from the product of $W^{4}{}_{64}$ and $W^{24}{}_{64}$. Moreover, the value of $W^{0}{}_{64}$ is a constant 1, and for $W^{16}{}_{64}$, only a negative sign is needed to add to the real part of the relevant data, and then to inverse the real part and imaginary part. So we can eliminate these two factors, that has to say, actually we just need 9 twiddle factors. In addition, we use 16-bit fixed point decimal to express these 9 twiddle factors. Although the fixed-point decimal arithmetic is not precise enough, it can satisfy the requirements of general systems. The architecture of BU is shown in Fig.3,

To obtain a high-speed computation, a three-stage pipeline structure is used for the complex multiplication. Here, In the BU, both of the complex inputs are 32 bits, i.e16-bit imaginary part and 16-bit real part. The sum of the complex inputs needs to be decreased by a factor of 2 to abstain arithmetic overflow, and the same operation is applied to the difference of them. Here, we have to use three complex multipliers. In addition, we have to use three intercepts & four registers. Every multiplexer is having control signal. The factor W^0_{64} and the parameter of the third multiplexer are not involved in the complex multiplier, and they can be used as a constant 1, just as Fig.3 has illustrated. Thus, the power consumption of the complex multiplier can be reduced. There are few important points. The twiddle factors and difference are both 32 bits, so the result of the first complex multiplier will be 64 bits. However, because we assume the fixed-point decimal computation, we should intercept it to a 32-bit parameter as the input of the third complex multiplier. The extraordinary advantage in this unit is that we use 4 32-bit registers to realize the four-stage pipeline of butterfly transform, using register1 & 2 to store the difference, register3 to store the intercepted result of third stage f_mult and register4 to store the final result cmul_b.

Figure-3: Butterfly Unit Block Diagram



Sources: Authors Compilation

CONCLUSIONS

This paper proposes FPGA based radix-2 FFT processor on Wireless LAN. To achieve high level and high performance, 8-point FFT pipelined architectures is used in butterfly unit. The parallel-pipelined FFT processor architecture can process input data at high speed, and the total system performance is improved due to adopting an address-mapping scheme. The radix-2 system, this mapping scheme is simpler and better than others. This design is implemented on FPGA chip. In addition, this pipelined FFT completes a complex 64-point FFT. The hardware testing result explains that it can meet the requirements of WLAN.

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AN ENHANCEMENT ON AD-HOC NETWORK PROTOCOLS USING QUALNET SIMULATOR

Nidhi Khetwal[35] Manisha Gururani[36]

ABSTRACT

Ad-hoc networks are characterized by multi-hop wireless connectivity, frequently changing network topology and the need for efficient dynamic routing protocols plays an important role. In which Modified AODV routing protocols gives better performance than AODV. This paper presents the simulation results in order to choose the best routing protocol to give the highest performance when implement the routing protocols in the target mobile application.

The simulations comparing two adhoc routing protocols named AODV (adhoc on demand distance vector) and MAODV (modified adhoc on demand distance vector) with different parameters Throughput, Jitter, PDR and Average end-to-end delay. The performance differentials analyzed using varying simulation CBR. These simulations are carried out using the QualNet simulator version 4.5.

KEYWORDS

Protocol, AODV, MAODV, Qual Net, Simulator Version 4.5 etc.

INTRODUCTION

The advancement in information technology and the need for large-scale communication infrastructures has triggered the era of Wireless Sensor Networks (WSNs). Mobile ad-hoc network (MANET) is a network of wireless mobile nodes, which communicate with each other without any centralized control or established infrastructure. Routing is the process of selecting paths in a network along which data is to be sent. Routing is a critical task in MANET where the nodes are mobile. Dynamic and reliable routing protocols are required in the ad-hoc wireless networks, as they have no infrastructure (base station) and their network topology changes. There are various protocols for handling the routing problem in the ad-hoc wireless network environment. In this paper, focus is given on studying the performance evaluation of various routing protocols using Qualnet simulator 5.0.2. The performance of the proactive, reactive and hybrid protocols are analyzed with different node densities for mobile and stationary nodes. The metrics used for the performance evaluation include average jitter, throughput, packet delivery ratio and average end-to-end delay.

ROUTING PROTOCOLS IN MANET

They are divided into three broad classes namely proactive, reactive and hybrid (combination of proactive and reactive routing). In proactive or table driven routing protocol every node maintains a routing table containing information of the network topology. The routing table contents changes with time due to the topology change because of node mobility. The table size is large as it contains information of all the nodes in the network.

DSDV, STAR etc. fall under this category. Reactive / on demand routing protocol dynamically initiates the route discovery process when needed. It is a lazy approach and its main aim is to reduce the size and maintenance overhead of the routing table. DSR, AODV and DYMO are typical examples of this category. Hybrid protocols like ZRP, TORA combine the salient features of both proactive and reactive approach to exploit the advantages of both

Zone Routing Protocol (ZRP)

Zone Routing Protocol (ZRP) [8, 9, and 10] defines a network with a number of virtual, overlapping routing zones. For every node there exists a z one with radius k hops i.e. all the nodes within k hop distance from the particular node is an element of that node's routing zone. The nodes on the circumference of a zone i.e. at hop k are referred to as peripheral nodes and other nodes within the zone are coined as interior nodes. ZRP combines two sub protocols, a proactive routing protocol: Intra Zone Routing Protocol (IARP) [6], used inside routing zones and a reactive routing protocol: Inter Zone Routing Protocol (IERP) [7], used between routing zones. A route to a destination within a node's routing zone is directly established from the routing table of that node by IARP subcomponent of ZRP otherwise the node creates a border casting tree and sends a route request (RREQ) packet to its peripheral nodes containing its own address, destination address and a unique sequence number (Seq_No.) as a part of IERP subcomponent of ZRP.

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WIRELESS NETWORK SIMULATORS

In the research of wireless networks, simulation tools play an important role. Analyzing the performance of network protocols in very large-scale scenarios with various parameter settings is often imprecise. Furthermore, performing actual experiments with large numbers of mobile devices is very difficult. Therefore, simulators become essential for wireless network research.
The two popular simulators in the wireless network research area are ns-2 [13] and GloMoSim [15], as we mentioned in section 2.1. The design of ns-2 uses OTcl as a command and configuration interface to the C++ object implementations. This approach incurs excessive memory overhead, which limits its scalability.

GloMoSim is designed for scalable wireless network simulation written in Parsec [18], a C-based simulation language. However, due to Parsec's large per entity memory requirements and the adoption of the node aggregation technique, GloMoSim has been shown to scale to 10,000 nodes [19].

Researchers from Cornell University design another wireless network simulator, SWANS [20]. It is built a top the JiST (Java in Simulation Time) platform. Its objective is to achieve high simulation throughput, save memory, and run standard Java network applications over simulated networks.

Our experiments are based on GTNetS [11, 12], which is designed specifically for large-scale network simulations. With CPU and memory overhead in consideration, GTNetS can finish large-scale network simulations within reasonable period.

EXPERIMENTS RESULTS

As we mentioned in section 2, the simulation model used to evaluate the performance of mobile ad hoc networks in very large-scale scenarios is implemented in GTNetS [11, 12]. GTNetS is designed specifically for modeling large-scale topologies. It has a number of features that address memory and CPU overhead, which enable simulation of larger networks than is possible with other simulation tools, notably the ns-2 simulator. The simulation modules involved in our experiments include application, transport, networking, routing, media access control, and node mobility models.

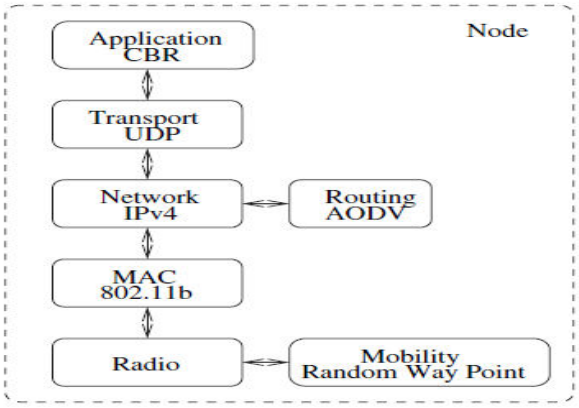
General Results

Our simulations were performed using network sizes ranging from 10,000 mobile nodes up to 50,000 nodes. The nodes were distributed uniformly within a specified geographic region. The size of the geographic region was varied for different numbers of nodes to keep the node density approximately constant except for the experiments to investigate the effect of node density on the performance. In the node density experiments, the same number of nodes is distributed in various sizes of geographic area to achieve different node density.

The MAC-layer protocol used in the simulations is the IEEE 802.11 distributed coordination function (DCF), with a channel capacity of 2 Mb/sec. The IEEE 802.11 model in GTNetS includes both RTS/CTS and virtual carrier sense features of the specification. The radio propagation range of each node was 250 meters.

Each simulation was executed for 300 seconds of simulation time. For the largest simulations with network topologies of 50,000 mobile nodes, the running time for a single simulation was about 30 hours. We ran the simulations for each scenario with different random seeds, and the results are averaged over the multiple runs.

Figure-1: Model for Simulation



Sources: Authors Compilation

More Simulation Results

We present the results achieved for the different simulation scenarios in this section. The metrics used to analyze the performance of AODV in our scenarios were as follows:

Packet Delivery Ratio

The packet delivery ratio is defined as the total number of data packets received at the destination divided by the number of data packets transmitted from the source.

End-to-End Latency

The end-to-end latency is defined as the difference of the time stamp when a data packet leaves a source node and the time stamp as it arrives at the destination. It is averaged over all successfully received data packets.

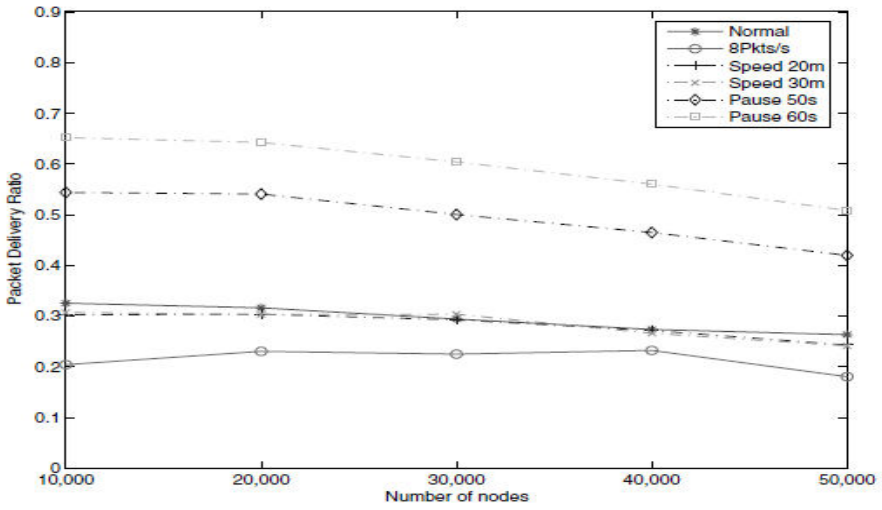
Control Overhead

The control overhead in AODV includes route request (RREQ), route reply (RREP), and route error (RERR) messages. Each hop-wise transmission of a control message by a node is considered as one control packet.

Average Hop Count

The average hop count is defined as the number of hops along a path averaged on all the successfully established routes. In addition, for each cause of packet loss, we measured their effects on the performance individually. The simulation results are illustrated in the following sections.

Figure-2: Packet Delivery Ratio



Sources: Authors Compilation

CONCLUSIONS

Scalability of the routing protocol in very large-scale mobile ad hoc networks is difficult due to the excessively long route and node mobility. We investigated in detail the scalability of on-demand routing protocols, using AODV as a representative sample, for very large-scale mobile ad hoc networks with up to 50,000 mobile nodes. We designed a set of comprehensive simulations to address the scalability analysis from different aspects, which include the effect of the network size, node density, number of data sessions, traffic load, and mobility. This unprecedented work was conducted using our GTNetS simulation environment, which makes it possible to simulate and study the performance of such large-scale networks in a reasonable time.

We presented the scalability performance of AODV from the aspects of packet delivery ratio, end-to-end latency, control overhead, and hop distance. A detailed analysis of the simulation results is presented from both quantitative and qualitative perspectives. In particular, to understand the fundamental reasons affecting the performance of these large-scale ad hoc networks, we isolated the causes for packet drops at various network layers and measured them for different network scenarios. These data can provide a guideline for the protocol design and future enhancements.

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CLOUD COMPUTING: A TOOL FOR ENHANCING THE COMPUTING POWER

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ABSTRACT

As we know that, now The Computer has become the most demandable and useful machine in the word and day by day the power of computer is enhancing more fastly. New applications and technologies is making computer more powerful so with the enormous increase in the demand for computing capacities, solutions with least investment have to found out. In this direction, cloud technology is a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software. Cloud computing encompasses any subscription-based or pay-per-use service that, in real time over the Internet, extends IT's existing capabilities. This article discusses briefly about cloud computing and its benefits. Application of this technology is increasing and this article looks at some of these applications.

KEYWORDS

Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Amazon, Cloud Computing etc.

INTRODUCTION

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: **Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS)** and **Software-as-a-Service (SaaS).** The name cloud computing was inspired by the cloud symbol that is often used to represent the Internet in flowcharts and diagrams.

A cloud service has three distinct characteristics that differentiate it from traditional hosting. The minute or the hour sells it on demand, typically; it is elastic, a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access). Significant innovations in virtualization and distributed computing, as well as improved access to high-speed Internet and a weak economy, have accelerated interest in cloud computing.

A cloud can be private or public. A public cloud sells services to anyone on the Internet. (Currently, Amazon Web Services is the largest public cloud provider.) A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. When a service provider uses public cloud resources to create their private cloud, the result is called a virtual private cloud. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services. Infrastructure-as-a-Service like Amazon Web Services provides virtual server instance to start, stop, access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. Because this pay-for-what-you-use model resembles the way electricity, fuel and water are consumed; it is sometimes referred to as utility computing.

Platform-as-a-service in the cloud is defined as a set of software and product development tools hosted on the provider's infrastructure. Developers create applications on the provider's platform over the Internet. PaaS providers may use APIs, website portals or gateway software installed on the customer's computer. Force.com, (an outgrowth of Salesforce.com) and GoogleApps are examples of PaaS. Developers need to know that currently, there are not standards for interoperability or data portability in the cloud. Some providers will not allow software created by their customers to be moved off the provider's platform.

In the software-as-a-service cloud model, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal. SaaS is a very broad market. Services can be anything from Web-based email to inventory control and database processing. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere.

CLOUD COMPUTING

Cloud computing is a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing new software. Cloud computing encompasses any subscription-based or pay-per-use service that, in real time over the Internet, extends IT's existing capabilities.

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Cloud computing is at an early stage, with a motley crew of providers large and small delivering a slew of cloud-based services, from full-blown applications to storage services to spam filtering. Yes, utility-style infrastructure providers are part of the mix, but so are SaaS (software as a service) providers such as Salesforce.com. Today, for the most part, IT must plug into cloud-based services individually, but cloud computing aggregators and integrators are already emerging.

Evolution of cloud Computing

The underlying concept of cloud computing dates back to the 1950s; when large-scale mainframe became available in academia and corporations, accessible via thin clients / terminal computers. Because it was costly to buy a mainframe, it became important to find ways to get the greatest return on the investment in them, allowing multiple users to share both the physical access to the computer from multiple terminals as well as to share the CPU time, eliminating periods of inactivity, which became known in the industry as time-sharing.

As computers became more prevalent, scientists and technologists explored ways to make large-scale computing power available to more users through time sharing, experimenting with algorithms to provide the optimal use of the infrastructure, platform and applications with prioritized access to the CPU and efficiency for the end users.

John McCarthy opined in the 1960s, "Computation may someday be organized as a public utility." Almost all the modern-day characteristics of cloud computing (elastic provision, provided as a utility, online, illusion of infinite supply), the comparison to the electricity industry and the use of public, private, government, and community forms, were thoroughly explored in Douglas Parkhill's 1966 book, *The Challenge of the Computer Utility*. Other scholars have shown that cloud computing roots go all the way back to the 1950s when scientist Herb Grosch (the author of Grosch's law) postulated that the entire world would operate on dumb terminals powered by about 15 large data centers.[10]

Due to the expense of these powerful computers, many corporations and other entities could avail themselves of computing capability through time sharing and several organizations, such as GE's GEISCO, IBM subsidiary The Service Bureau Corporation (SBC, founded in 1957), Tymshare (founded in 1966), National CSS (founded in 1967 and bought by Dun & Bradstreet in 1979), Dial Data (bought by Tymshare in 1968), and Bolt, Beranek and Newman (BBN) marketed time sharing as a commercial venture.

The development of the Internet from being document centric via semantic data towards more and more services was described as "Dynamic Web". This contribution focused in particular in the need for better meta-data able to describe not only implementation details but also conceptual details of model-based applications. The ubiquitous availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, autonomic, and utility computing have led to a tremendous growth in cloud computing.

After the dot-com bubble, Amazon played a key role in the development of cloud computing by modernizing their data centers, which, like most computer networks, were using as little as 10% of their capacity at any one time, just to leave room for occasional spikes. Having found that the new cloud architecture resulted in significant internal efficiency improvements whereby small, fast-moving "two-pizza teams" (teams small enough to be fed with two pizzas) could add new features faster and more easily, Amazon initiated a new product development effort to provide cloud computing to external customers, and launched Amazon Web Service (AWS) on a utility computing basis in 2006.

In early 2008, Eucalyptus became the first open-source, AWS API-compatible platform for deploying private clouds. In early 2008, OpenNebula, enhanced in the RESERVOIR European Commission-funded project, became the first open-source software for deploying private and hybrid clouds, and for the federation of clouds. In the same year, efforts were focused on providing quality of service guarantees (as required by real-time interactive applications) to cloud-based infrastructures, in the framework of the IRMOS European Commission-funded project, resulting to a **real-time cloud environment**. By mid-2008, Gartner saw an opportunity for cloud computing "to shape the relationship among consumers of IT services, those who use IT services and those who sell them" and observed that "organizations are switching from company-owned hardware and software assets to per-use service-based models" so that the "projected shift to computing will result in dramatic growth in IT products in some areas and significant reductions in other areas."

On March 1, 2011, IBM announced the Smarter Computing framework to support Smarter Planet. Among the various components of the Smarter Computing foundation, cloud computing is a critical piece.

APPLICATIONS OF CLOUD COMPUTING

Gmail

Gmail is a free, advertising-supported email serviced provided by Google. Gmail was launched as an invitation-only beta-release on April 1, 2004 and it became available to the public on February 7, 2007, though still in beta status at the time. As of November 2010, it had 193.3 million users monthly.

Google Calendar

Google Calendar is a free time-management web application offered by Google. It became available on April 13, 2006, and exited the beta stage in July 2009. Users are required to have a Google account in order to use the software.

Google Groups

Google Groups is a service from Google that supports discussion groups based on common interests. Membership in Google Groups is free of charge and many groups are anonymous. Users can find discussion groups related to their interests and participate in threaded conversations, either through a web interface or by email. They can also start new groups.

Google Docs

Google Docs is a free, web-based word processor, spreadsheet, presentation, form, and data storage service offered by Google. It allows users to create and edit documents online while collaborating in real-time with other users. Data storage of any files up to 1GB each in size was introduced on January 13, 2010.

Google Sites

Google sites are a structure wiki and web page creation tool offered by Google as part of Google Apps. It started out as Jotspot and it was targeted mainly at small-sized and medium-sized businesses.

Dropbox

Dropbox is a web-based file hosting service, which uses cloud computing to enable users to store and share files and folders with others across the internet using file synchronization. There are both free and paid services, each with varying options.

Basecamp

Basecamp is a web-based project management tool launched in 2004. Basecamp primary features are to-do lists, milestone management, forum-like messaging, file sharing, and time tracking.

Highrise

Highrise is a 'shared contact management' web application, which supports basic CRM tasks. The application centers on person and company pages, which collate information such as images, notes, and contact detail.

Backpack

Backpack is a web-based personal information manager and intranet for small business. The application has two main functions: user-created pages (which can include text, images and files) and an iCalendar format calendar. Features of the user-created pages include to-do lists, inline photo galleries, notes and file attachments, and page sharing.

Campfire

Campfire is a business-oriented online chat service. The application uses Ajax technology for real time communication. To use the application, users must either create a new chat room or be invited to one. Unless a chat room is specifically chosen to be "off the record", browsable transcripts of chats and uploaded files are stored for future reference.

Evernote

Evernote is a suite of software and services designed for notetaking and archiving available in a paid version or a more restricted, advertising-supported, 'free' version. A 'note' can be a piece of format table text, a full webpage or webpage excerpt, a photograph, a voice memo, or a handwritten 'ink' note. Notes can also have file attachments. Notes can then be sorted into folders, tagged, annotated, edited, given comments, and searched.

Logmein

LogMeIn is a suite of software services that provides remote access to computers over the internet. The various product versions are designed for both end users and professional help desk personnel.

PayCycle

PayCycle Inc. is an online payroll service started in 1999 by Rene Lacerte and Martin Gates. It was the first company to introduce a completely internet-based payroll service.

Xero

Xero is an online accounting software product for small and medium-sized businesses, as well as personal finance. It allows business owners and their employers, accountants, bookkeepers and other financial advisors access to up-to-date financial records in real-time with the only system requirement being a suitably-configured internet browser.

WorkFlowMax

WorkflowMax allows you and your staff to track time, manage jobs, create quotes, purchase orders and invoices. Using the advanced reporting, measure how productive your team is, whether you are on schedule and more importantly how much money you are making on each job.

Carbonite

Carbonite is an online backup service available to both Windows and Mac users that provides unlimited backup space to consumers and small businesses. It is named after carbonite, the fictional substance used to freeze Han Solo in Star Wars: The Empire Strikes Back.

Springpad

Quickly and easily save ideas and information you want to remember. Springpad automatically categorizes your stuff and enhances it with useful links. Share your stuff, set reminders and get alerts to relevant news, offers and deals.

CONCLUSIONS

Now we can say that cloud Computing has emerged as a powerful tool for enhancing the computer power and we may use the computer with more efficiently and effectible with the use of cloud computing. The benefits of cloud Computing and various applications have also been discussed.

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CLOUD SUPPORTED E-LEARNING FRAMEWORK FOR COST EFFECTIVE ONLINE LEARNING

Vishal Raghav[39] Prateek Sharma[40]

ABSTRACT

Software as a Service has been with us for some time like use of email services. This is a decades old concept. Educators to provide online contents have been using cloud-hosted services to deliver education for over a decade.

This paper aims to propose an Online Learning Management System (OLMS) delivered via the cloud in form of a web application seamlessly delivered over the Internet, and accessible from anywhere in the world. It is hosted on servers at a third parties' data center. The use of the Online Learning Management System is rented. The cost can be minimized as the software is updated frequently, and does not have to be maintained by the customer.

This paper analyzed the difference that what a user should expect from the cloud: in terms of features, security, redundancy, scalability, automation and cost reduction.

KEYWORDS

Cloud, Software As A Service, OLMS, Data Center, Cloud Security etc.

INTRODUCTION

From the user standpoint, the concept of cloud computing can best be explained as a collection of server delivering resources that can be accessed remotely via the Internet in real-time. These servers are housed in a bunker like structure called a Data Center. In other words, your data, your software applications are not housed on your computer; they are on a service's cloud of web servers (often virtual servers) usually accessed by you via the Internet using a browser like Chrome or IE. You are renting the use of the software and storage space. The cloud is effectively a group of servers; more specifically– "virtual servers"–that simulate running multiple computers on a single piece of hardware. This is beneficial since it is possible to get more use out of the piece of hardware than if it was just doing the work of one.

A simple explanation: If I have ten Dell servers, each at 10% utilization I will have ten physical pieces of equipment to maintain and upgrade or using the cloud, I can have only one server at 100% utilization. The term cloud leverages the fact that these virtual servers can be started up, shut down, upgraded, moved from physical machine to physical machine, etc all through software and in response to demand or other event. For example, you might want to have more web servers running during the day when traffic is high and fewer during the evening when traffic is low. Typically, cloud servers cost out per hour. This can be more economical than keeping all of your web servers running all of the time.

CLOUD COMPUTING FOR E-LEARNING

Clouds are defined by the technology they provide: computation, software, data access, and storage services. A cloud can be defined as a place for users to create or store files, but has alternative meanings that, for example, explain how using a cloud can optimize processing power on the user end through its network. Services now deliver software such as Microsoft Office from the cloud. This means a computer user is renting the use of the software- usually via a monthly payment automatically deducted from a credit card.

Enterprises have been using hosted applications for learning software for over a decade. Software as a service (SaaS) is one type of computing that is usually in the cloud and delivers a single application through the browser to thousands of customers using a multitenant architecture. The biggest change in attitude towards the cloud has come over time as Chief Technology Officers realize they do not have to maintain software and services within their own buildings and can maintain the same control via renting the software and server capacity. Alternatively, the CTO realizes their kingdoms are at capacity and welcome departments outsourcing to the cloud. Think– enterprise sales tracking installed on each salesperson's desktop containing a copy of ACT or a ten-dollar a month bill for each salesperson's online login to SalesForce.com.

Therefore, it goes for distance education using the Internet. Advanced Learning Management Systems now also come with services attached. Often administrative support and consulting services are included on the use of the software, allowing the customer to build corporate eLearning viability and online education business offerings.

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Learning Services: Delivery of Learning

A learning management system (LMS) delivered via the cloud is generally a web application seamlessly delivered over the Internet, accessible from anywhere in the world. It is hosted on servers at a third parties' data center. The use of the Learning Management System is rented. Advantages for the enterprise are that the software is updated frequently, and does not have to be maintained by the customer.

The application is essentially "version-less" in the customer's mind since only one active code release exists. Usually the LMS SaaS provides updates on a quarterly or bi-yearly basis. The using enterprise does not have to purchase hardware or people to operate/set up the servers. In addition, during peak usage the cloud service increases capacity to service more users. Sophisticated clouds will automatically spawn virtual services to meet increasing demand. Some purists claim that this capacity to automatically spawn virtual services is a key part of being a cloud service. Others use the term more loosely.

Learning Objects / Modules

The e-Learning pundits are talking about for 2012 is authoring content in the cloud. The cloud provides the capability for collaborative development tools for creating, reviewing, and publishing interactive tutorials, assessments, and learning objects. Typically, the control of authoring eLearning content rested with individuals working with specific authoring software installed on desktops. Project managers looking for efficiency and repeatability have longed for online systems that allowed for distributed workflow that is scalable. Imagine an online system where subject matter experts can review module pages anytime/anywhere and comment in context and where comments are captured in a database. The pundits are saying that if websites can be built on a "what you see is what you get" model so should it be for eLearning content.

CONCERNS BEFORE DEPLOYMENT

As an eLearning manager, it is imperative to make sure you are getting the advantages of the cloud when a company uses the buzzword in their product promotion. Perhaps some of the biggest concerns hidden in the haze of the cloud's popularity are its ability to deliver on the promise of redundancy, scalability, and security. Where these virtual servers are housed is a legitimate question to ask. There are no guarantees. Amazon had a 2011 publicized service hiccup due to human error and Sony has been hacked. Known security issues exist with larger brands, whereas many good SaaS providers have impeccable records. So go figure. Here are few topics to ask questions about.

Redundancy and Scalability

The key to redundancy is to design an architecture that does not have any single point of failure. A cloud computing system must make multiple copies of client information, store it on other devices, and transfer workloads for easier information retrieval or in case of a break down. Redundancy enables the central server to access backup machines to retrieve data that otherwise would be unreachable.

The redundancy associated with clouds is not always a given, but it is easier as a side effect of this structure. Since most of the cloud serving a site should be made out of disposable machines (since it's ideal to shut them down, start them back up, rebuild them, clone them frequently) the loss of one or more virtual machines due to a software or hardware issue is less of a problem than it would be otherwise. This does not apply to all, but to most.

Security

The security of the software running on the cloud is up to whoever is managing it. The security benefits of running in the cloud at a reputable data center must meet certain physical location security measures to accommodate; like HIPPA or other guidelines.

Some data centers are certified (SSAE 16) and must submit to security audits. Regularly performing a security analysis is vital to the security of any network. It is the only way to ensure that firewalls and access controls are properly configured and that server updates have been applied. Consider the importance of both physical and electronic security escort-only physical security, alarm system, video surveillance, motion detectors and glass break detectors, and dedicated network security experts. Ask your cloud provider if the data center is certified.

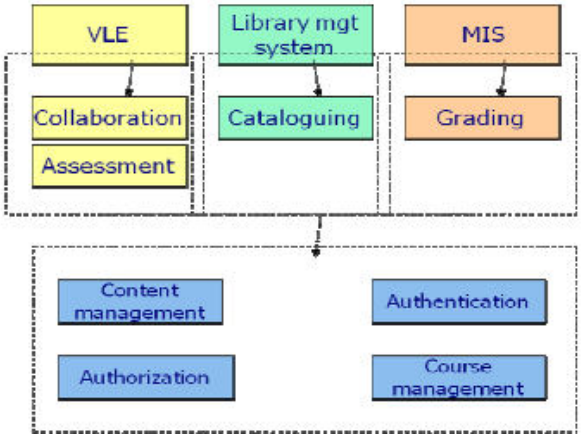
All of this can be thrown out of the window when talking about many uses of the cloud. It is a big buzzword/ marketing term and is thrown around a lot. In some cases, it means that someone has placed one or more constantly running virtual machines on a provider, but it is not anything new. It just has a new name.

As an eLearning manager looking to deliver, author and store content in the cloud, you should be asking questions about auto redundancy, scalability and security. A reputable company with a handle on these important aspects of cloud computing is much more reassuring than just a brand name.

TRADITIONAL E-LEARNING AND CLOUD BASEDE-LEARNING

E-Learning is an Internet-based learning process, using Internet technology to design, implement, select, manage, support and extend learning, which will not replace traditional education methods, but will greatly improve the efficiency of education. As e-Learning has a lot of advantages like flexibility, diversity, measurement, opening and so on, it will become a primary way for learning in the new century as in Figure 1.

Figure-1

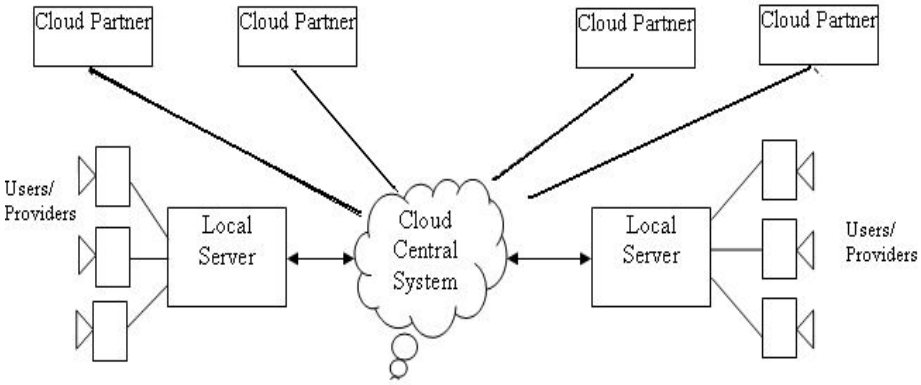


Sources: Authors Compilation

This paper is going to propose an innovative e-learning ecosystem based on cloud computing and Web 2.0 technologies. The paper analyses the most important cloud-based services provided by public cloud computing environments such as Google App Engine, Amazon Elastic Compute Cloud (EC2) or Windows Azure, and highlights the advantages of deploying E-Learning 2.0 applications for such an infrastructure. The authors also identified the benefits of cloud-based E-Learning 2.0 applications (scalability, feasibility, or availability) and underlined the enhancements regarding the cost and risk management.

Our proposed system primarily is composed of different cloud partners, local servers and cloud central system. The architecture is depicted in Figure 2.

Figure-2: Cloud Based E-Learning



Sources: Authors Compilation

According to our proposed architecture each individual PC act as a cloud partner, which offers the necessary resources to the cloud system from its available resources. However, each of these individual PC is the property of a particular educational institute or University study center whereas all these partners or users owned those tablet PCs like "aakash" from the budget sanctioned by the government for that particular institute or University. There is a local server associated with individual study center of an institute who monitors everything ranging from PC status to individual requests for that institute. The users associated with a particular local server submit their request to the cloud via the local server. The local server collects the entire request from the clients in its domain within a specific time and forward those request after verification. In addition, some providers have the agreement with the cloud system and offers different services to the user.

The proposed e- learning cloud architecture can be divided into the following layers: Infrastructure layer as a dynamic and scalable physical host pool, software resource layer that offers a unified interface for e-learning developers, resource management layer that achieves loose coupling of software and hardware resources, service layer, containing three levels of services (software as a service, platform as a service and infrastructure as a service), application layer that provides with content production, content delivery, virtual laboratory, collaborative learning, assessment and management features.

Infrastructure layer is composed of information infrastructure and teaching resources. Information infrastructure contains Internet/Intranet, system software, information management system and some common software and hardware; teaching resources is accumulated mainly in traditional teaching model and distributed in different departments and domain. This layer is located in the lowest level of cloud service middleware, the basic computing power like physical memory, CPU, memory is provided by the layer. With virtualization technology, physical server, storage and network form virtualization group for being called by upper software platform. The physical host pool is dynamic and scalable, new physical host can be added in order to enhance physical computing power for cloud middleware services.

BENEFITS FROM THE ARCHITECTURE

- **Powerful Computing and Storage Capacity**

  Cloud based E-learning architecture locates the computing and data in a large number of distributed computers, the sea of clouds in the tens of thousands of computers to provide powerful computing power and huge data storage space, puts the "cloud" as a service available to students via the Internet.

- **High Availability**

  Through the integration of mass storage and high-performance computing power, this system can provide a higher quality of service. Cloud computing system can automatically detect the node failure and exclude it, do not affect the normal operation of the system.

- **High Security**

  In the cloud-computing model, data is storied intensively. Relying on one or more data center, the managers manage the unified data, allocate the resources, balance load, deploy the software, control security, and do the reliable real time monitoring, thus guarantee the users' data security to the greatest possible degree.

- **Virtualization**

  Virtualization is the most important characteristics of this type of architecture. Each application deployment environment and physical platform is not related. It is managed, expensed, migrated, and backup through virtualization platform. It put the underlying hardware, including servers, storage and networking equipment, comprehensive virtualization, in order to build a resources pool of shared, distributed on-demand.

The major advantage of the proposal is that it aims at providing easy access to costly software running on high performance processors to rural students at institutions, which lack considerable facilities. Considerable investment would be required to implement this architecture, but the benefits would easily justify the cost.

CONCLUSIONS

The e-Learning model cannot completely replace teachers; it is only an updating for technology, concepts and tools, giving new content, concepts and methods for education, so the roles of teachers cannot be replaced. The teachers will still play leading roles and participate in developing and making use of e-learning cloud. The blended learning strategy should improve the educational act. Moreover, the interactive content and virtual collaboration guarantee a high retention factor. On the other hand, E-learning cloud is a migration of cloud computing technology in the field of e-learning, which is a future e-learning infrastructure, including all the necessary hardware and software computing resources engaging in e-learning. After these computing resources are virtualized, they can be afforded in the form of services for educational institutions, students and businesses to rent computing resources.

Present economic situation will force different educational institutions and organizations to consider adopting a cloud solution. Universities have begun to adhere to this initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of cloud solutions. The aim of our work was to identify an architecture, which will be using Cloud Computing within school level or higher education. Mainly, we have considered the benefits of cloud architecture. Future research will include a study regarding the attitude and strategy for migration to the proposed architecture based on clouds.

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UTILIZATION THE POWER OF CLOUD COMPUTING TO OFFER E-GOVERNANCE SERVICES THROUGH SAAS MODEL

Rajan Manro[41] A. S. Joshi[42]

ABSTRACT

The increasing use of cloud computing has forced the governments to assess or offer e-Governance service using this new delivery model. With the governments of major countries, especially the United States, encouraging cloud adoption, governments of Asia Pacific countries too are gaining confidence and increasingly evaluating cloud computing. The power of proposition of moving to the cloud is too attractive for the governments to ignore. The e-Governance services like e-passport or e-learning can be offered easily through fully customized Service oriented Clouds. In this paper we are presenting tight similarities between generic government functioning and the service oriented cloud approach and how we can utilize the power of cloud computing in e-Governance sector. In addition, we will discuss the benefits in cloud based e-Governance services for governmental organization. The paper analyzed that SaaS model of cloud computing is better to implement in first phase of e-Governance services offering to citizen in a cloud environment in lower cost and with a green touch.

KEYWORDS

e-Governance, e-learning, SaaS, G2C, PaaS, Cloud Computing etc.

INTRODUCTION

Government agencies are in various stages of development and are looking for ways to improve their service provisioning, and using e-Governance service they are in position to offer the same but at the same time they are looking for ways to reduce their costs due to severe budget cuts. It is often argued that there is a need for restructuring structures and processes to improve efficiency and effectiveness [1]. One way of restructuring the IT function is by embracing the software delivery model of cloud computing named Software as a Service (SaaS). This can be tested as a new type of sourcing model to offer e-Governance services to maximum users in less cost and minimum infrastructure requirements thus the power of cloud computing can be utilized to offer that services using SaaS model over communication networks to end users.[2]

However, many governments have already initiated the use of cloud models in the aspects of computerization of certain e-Governance services but the need of the time is to have an integrated approach to all types of government services under the cloud framework of more customizable, distributed and scalable system.

The use of SaaS model of cloud computing might provide the opportunity to lower cost, but also to deliver software applications to end-users over the web, providing a much more flexible experience in terms of time and location of access [3]. Although the current literature focuses primarily on business-oriented SaaS services [4], within the public sector there are some notable and visible examples of SaaS as well. This includes the use of office applications provided by the SaaS model and the use of services to the citizens. In the latter situation, the services provided by a SaaS provider are integrated in the website of the agencies responsible for providing the services and the data is communicated to the agency to enable the processing. In both examples, the governmental agencies do not have to develop or maintain the services in-house and rely on the SaaS provider.

This paper is structured as follows. In the next section, the background of SaaS and related components such as grid computing, cloud computing are discussed. Next, the research approach and proposed frame work is presented, followed by a discussion of the findings. Finally, conclusions are drawn.

BACKGROUND

Whereas in the past software was bought and locally installed and maintained, the cloud models resemble a fundamental new way of thinking in which software is rented and remotely provided. SaaS type of cloud applications has existed almost for a decade and has been advocated for a faster implementation of software changes and focus on the demand-side [5].

In cloud computing SaaS is a software delivery model in which services are installed, assembled and maintained on the systems of the SaaS provider and used by others over the Internet. The user pays a certain fee for the use of the software or for a certain period that the software is used. The latter case is like a subscription that can easily be terminated, as no large investments need to be made. The software ownership often remains at the SaaS provider of the software, although this is not necessary. In traditional models, license buying or software development costs are high, but the variable cost of sale is substantially lower than for hardware. In the SaaS model, no large upfront investments are needed, but the variable costs can be substantially higher. Payment might be dependent on elements such as the number of users and the expected lifetime of users.

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The basic long-term vision of SaaS is centered on separating software possession, maintenance and ownership from its actual use. SaaS providers will often not only provide one service of a certain software suite, but also might typically provide a bundle of software services, although models are possible in which SaaS services are provided by the company who has developed the software. By delivering a set of software as services, the idea is that many of the present limitations constraining its use, deployment and evolution can be overcome. The shift in offering services also has implications for the SaaS providers' revenue models. Traditionally, the customer buys a license to use an application and installs it on their owned or controlled hardware.

Over time, new updates can be installed, including security patches and other control and update activities. [6] By buying a license, the customer gets unlimited usage of the software. Per user or preinstalled system, additional licenses might be necessary. In contrast, in the SaaS models the user does not buy a lifetime license. The user pays a certain amount for the software running on a third-party server and loses access when he ceases payment.

The Cloud provides a powerful and cost effective platform to develop new applications and new ways to deliver e-Governance services and other information to communities. [7] In Cloud based model various levels of government can take advantage of the power of open data-placing information and services directly into the hands of citizens. Government Agencies are looking for ways to take advantage of cloud computing, while maintaining data security and protection, and new initiatives take many forms. Here are a few examples of how agencies are getting started. [8]

The U.S. Patent and Trademark Office's financial and acquisition system, dubbed Momentum, has one production environment and four test environments, comprising 25 servers with 10 integrations. The production database, including the failover database, is 2 TB, while the test database is 4 TB. (All are Oracle.) The test database is production-sized and refreshed with scrubbed production data periodically. USPTO is assessing the feasibility of moving Momentum to a cloud environment.

The Department of Education is planning to issue an RFP for the operation and maintenance of its Migrant Student Information Exchange, and it is interested in cloud computing as a potential way of providing those capabilities. MSIX, implemented in 2007, contains records for 97% of the migrant student population, with data from 41 states.

The Department of Transportation, Federal Aviation Administration, and Air Traffic Organization may explore cloud computing in a test program. This program would provide a virtual production environment that simulates ATO's production environment, which is spread across a number of facilities. The virtual environment would be used to provide email service and to develop and test software.

GREEN TOUCH WITH CLOUD SUPPORTED E-GOVERNANCE

The cloud computing industry represents a large ecosystem comprising of many models, vendors and market niches. Significant investments are being made by leading technology players to create tailor-made cloud computing solutions for government's service. The benefits of cloud computing for government services offering are following:

Sharp Spikes in Demands for Infrastructure

Government to Citizen ("G2C") services witness periodic and often unpredictable peaks of demand. As a result, ICT infrastructure created as part of e-governance initiatives often hold excess capacity, which is unused most of the time.

Similar Software Investments Leading to Redundancy

Often similar software solutions are required by more than one government agency like the one same e-learning software can be used in many states of India. One of the largest software investments made by government agencies is in procurement of office productivity software and collaboration solutions. The license costs and creating ICT infrastructure for hosting these solutions often constitute a large portion of software costs of governments. This not only entails higher investments in servers but also desktop processing power.

Complex Software Change Logistics

Low levels of IT infrastructure maturity and complex organizational structures in government make software upgrades difficult. It requires significant time investments from IT support staff of government agencies to track the rollout of changes on each individual workstation.

Inadequate Capacity for ICT Management

Government agencies make large investments in creating data centers and networks for their needs and due to inadequate internal capacity for ICT management, service levels often leave a lot to be desired. It also creates information security related vulnerabilities.

Difficulties in Enforcing ICT Standards

Considering the autonomy enjoyed by government agencies in ICT procurement, it is often difficult to enforce minimum ICT standards, which are vital for creating a uniform Government Enterprise Architecture.

It is in this context that the two aspects of cloud computing are of interest. First, scalability and on-demand procurement of software services, platform and infrastructure. Government agencies could procure to meet additional needs on a need basis. This will save setup and maintenance costs as well as contribute to green computing initiatives as cloud computing setups can provide the scale necessary to make green technologies feasible.[9]

COST CUTTING BY SAAS MODEL

The IT sector of government of India has an opportunity to enhance their current offerings and reach to rural citizen by making them cloud ready. They can also use remote testing and prototyping services in addition to remote application hosting services such as Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). Cloud based services can be leveraged by the government to launch new e-Governance initiatives quicker and with lower overhead costs. A common cloud platform will also enable local governments and other public agencies to adopt e-Governance for better citizen services, without requiring the setting up of significant IT infrastructure.

CONCLUSIONS

The Cloud has potential to transform not only business ecosystem but also day-to-day challenges of Indian citizens including necessary government services such as healthcare and education. Currently, India lags behind developed countries in terms of established data centers operating in the country. Economic benefits of having data management centers in the country are huge and the Cloud Policy will have to provide a clear vision to enable such an outcome. The Cloud unlike previous technology shifts is not a mere collection of technologies but a transformational concept, which requires the ecosystem to be developed.

In addition, special financial provisions in-terms of cloud infrastructure, loans, tax incentives and land should be made available by the Indian Government for the private players who wish to build infrastructure for cloud computing .At last Cloud computing can play a significant role in e-governance, in the following ways:

- The expansive storage capacity of the Cloud can be leveraged to host unique (and large) datasets, making them available to citizens or researchers with Web browsers.
- The government can almost instantly scale its successful applications/services as more and more citizens begin availing of them, on a need-to-basis.
- The Cloud can enable organizations to deliver better services, even as they work with fewer resources.
- By sharing, IT services in the Cloud, huge savings and economies of scale and standardization can be achieved in a lower cost implementation.
- Cloud solutions can help improve transparency, a major goal for government enterprises.

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WORLD CLOUD STATISTICS: THE BRILLIANT FUTURE

Sunita Manro[43] Prof. Jagmohan Singh[44] A. S. Joshi[45]

ABSTRACT

The objective of this paper is to study the impact of cloud computing on the modern world. Further, the study also attempts to answer whether the services of cloud computing are significant in the different domains. Cloud computing is renowned for its ability to allow employees to access the business from any location in the world. This combats any weather related issues that could hinder business at any point in the year, providing there is an internet connection.

With cloud computing increasing in popularity, we would like to share some of the key statistics into why industry experts think it is the way forward for your business.

KEYWORDS

Cloud, Gartner, IDC, Statistics, Iaas, Saas, Paas, Cloud Computing etc.

INTRODUCTION

Cloud Computing has become one of the most popular topics of conversation among the IT community. There have been countless polls and surveys conducted to find out more understanding on the market information and industry trends. The advent of cloud computing in recent years has sparked an interest from different organizations, institutions, and users to take advantage of web applications. This is a result of the new economic model for the Information Technology (IT) department that cloud computing promises.

The model promises a shift from an organization required to invest heavily for limited IT resources that are internally managed, to a model where the organization can buy or rent resources that are managed by a cloud provider, and pay per use. Cloud computing also promises scalability of resources and on-demand availability of resources.

STATISTICS OF CLOUD USAGE

Cloud computing has been around for more than a decade, 2011 really marks the year it is becoming widely adopted. Consumers and businesses are realizing that the cloud offers a variety of solutions to problems that plague computer-users daily. Small and medium sized businesses are the largest growing segment in cloud computing.

Companies, which are not using cloud, are feeling pressure to do so, and those who have already are seeing the benefits. With the year 2012, it wonders what new trends and innovations the cloud computing industry will bring?

Here are some of the most interesting statistics from the past few years:

1997: NetCentric tried to trademark the "cloud computing" but later abandoned it in April 1999.

2001: New York Times ran an article by John Mark off about Dave Winer's negative reaction to Microsoft's then new .Net services platform called Hailstorm (if you want a laugh sometime, ask a Microsoft Azure person about Hailstorm). It used the phrase "'cloud' of computers."

2006: Eric Schmidt of Google described their approach to SaaS as cloud computing at a search engine conference. It was the first high profile usage of the term, where not just "cloud" but "cloud computing" was used to refer to SaaS and since it was in the context Google, the term picked up the PaaS/IaaS connotations associated with the Google way of managing data centers and infrastructure.

2007: In US, 69% of online users were using some form of cloud computing!

Below is a rundown of the share of internet users who have done a select set of online activities that involve storing data online or accessing applications in cyberspace.

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Table-1

Cloud Usage	Percentage
Internet users use webmail services such as Hotmail, Gmail, or Yahoo! Mail	56%
Store personal photos online	34%
Use online applications such as Google Documents or Adobe Photoshop Express	29%
Store personal videos online	7%
Pay to store computer files online	5%
Pack up hard drive to an online site	5%

Sources: Authors Compilation

Overall, 69% of online users have done at least one of these six activities, with 40% of internet users having done at least two of them. Convenience and flexibility are the watchwords for those who engage in at least one of the cloud computing activities listed above.

- 51% of internet users who have done a cloud computing activity say a major reason they do this is that it is easy and convenient.
- 41% of cloud users say a major reason they use these applications is that they like being able to access their data from whatever computer they are using.
- 39% cite the ease of sharing information as a major reason they use applications in cyberspace or store data there. At the same time, users report high levels of concern when presented with scenarios in which companies may put their data to uses of which they may not be aware.
- 90% of cloud application users say they would be very concerned if the company at which their data were stored sold it to another party.
- 80% say they would be very concerned if companies used their photos or other data in marketing campaigns.
- 68% of users of at least one of the six cloud applications say they would be very concerned if companies who provided these services analyzed their information and then displayed ads to them based on their actions.

2008: Gartner saw an opportunity for cloud computing "to shape the relationship among consumers of IT services, those who use IT services and those who sell them "and observed that "organizations are switching from company-owned hardware and software assets to per-use service-based models" so that the "projected shift to computing... will result in dramatic growth in IT products in some areas and significant reductions in other areas." As the figure shows, cloud users showed high levels of concern when presented with scenarios in which companies might use their data for purposes users may or may not fully understand ahead of time. This suggested user worry over control of the information they stored online. For nearly all of the scenarios shown, most users of cloud applications said they would be very concerned if their data were sold, used in marketing campaigns, not deleted as requested, or used for targeted ads.

Table-2

Attitudes about possible data policies of "cloud" services

% of those who use online applications and services to store data

Thinking about your data, such as email, photos, and other files that you put on these online services, how concerned, if at all, would you be if companies that provide these services . . .

	Very	Somewhat	Not too	Not at all
Sold your files to others	90%	5%	2%	3%
Used your photos and other information in marketing campaigns	80	10	3	6
Analyzed your information and then displayed ads to you that are based on what you have in the those files	68	19	6	7
Kept a copy of your files even if you try to delete them	63	20	8	8
Gave law enforcement agencies your files when asked to do so	49	15	11	22

Source: Pew Internet & American Life Project April-May 2008 Survey. N=999 for those who have used online services to store personal information. Margin of error is ±3.5%.

Sources: Authors Compilation

2009: There were 360,985,492 internet users in 2000. In 2009, that number increased to 1,802,330,457. That is roughly 27% of the entire world population.

2010: According to IBM survey, the Cloud cuts IT labor costs by up to 50%, improves capital utilization by 75%. The sales of public cloud services grew at a 25 percent annual clip. It was estimated that SaaS Revenue will Grow Five Times Faster than Traditional Packaged Software Through 2014.

2011: Amazon's Web Services provided businesses with an infrastructure web services platform totally based on the cloud. Their offering, started in 2006, hit revenue of around $500 Million in 2010. The Amount ($750 Million) Amazon.com's AWS expected to earn in 2011.

2012: Nearly 85% of net-new software firms coming to market will be built around SaaS service composition and delivery. 80% of new commercial enterprise applications will be deployed on cloud platforms (IDC). It is estimated that this percentage of applications using cloud platforms will only rise as more start-ups launch and being to use only cloud platforms.

CLOUD IN FUTURE

IDC expects that less than 15% of net-new software firms coming to market will ship a packaged product (on CD). In 2013, the acceptance rate will vary from 28% to 42% (on some tracks or workshops it can go to 45%, on others can drop to 23%). There are 50 Million servers worldwide today. By 2013, 60% of server workload will be virtualized. The size of the Cloud Computing Market will be $150 Billion by 2013. This amount comes from a study done by Gartner. Merrill Lynch's research predicts the cloud computing market to be worth $160 Billion by the same year.

By 2014, about 34% of all new business software purchases will be consumed via SaaS, and SaaS delivery will constitute about 14.5% of worldwide software spending across all primary markets. About 65% of new products from established ISVs will be delivered as SaaS services. SaaS-derived revenue will account for nearly 26% of net new growth in the software market in 2014. 60% Server workloads that will be virtualized by 2014.

According to Gartner, this is a staggering percentage, especially when compared to 2008, when only 12% of server workloads were virtualized. A business vitalizing their workload into the clouds has multiple benefits like:

1. They are saving themselves the trouble of having to purchase and store physical hardware, which is costly and inefficient.
2. Companies can reduce their carbon footprint by outsourcing their workload to data centers.

It is not surprising that experts are predicting the market to grow at such a high rate in the next few years.

According to the study by Nasscom and Deloitte, it is estimated that the Indian cloud computing market will reach USD 16 billion by 2020. Similarly, a report by consulting firm Zinnov Management Consulting estimates that the cloud computing market will grow from USD 400 million (currently) to USD 4.5 billion by 2015. A recent Microsoft-IDC study says that cloud computing will generate over 2 million jobs in India by 2015. By 2016, 40 percent of enterprises will make proof of independent security testing a precondition for using any type of cloud service. At year-end 2016, more than 50 percent of Global 1000 companies will have stored customer-sensitive data in the public cloud. Gartner's prediction behind this was the cost savings benefits for the companies. However, it goes along with the previous prediction as well; again, people are more likely to head to the cloud once they know it is completely secure.

CLOUD'S ROLE IN JOB CREATION IN ASIA

Cloud computing, doing an IT startup is now more affordable. More the new businesses we have, more jobs opportunities there are available to the larger population. According to research conducted by IDC, cloud computing will create nearly 14 million new jobs by 2015 globally. Communications and media are expected to amount for 1.8 million cloud-related jobs by 2015, while banking will hit 1 million in Asia only. Other parts of APAC, including Australia, Malaysia, Japan, and Korea are expected to enjoy a growth rate as high as 155 percent in cloud-related jobs. The details of job growth in Asian countries are given below:

Table-3

Country	Population (Millions)	Year 2012	Year 2015	Job Growth (%)	Country	Population (Millions)	Year 2012	Year 2015	Job Growth (%)
China	1.324	2,514,908	4,631,956	84	Singapore	5.29	11,184	23,389	109
Korea	49.72	102,911	200,498	95	Indonesia	246.9	452,012	915,848	102
Japan	126.3	102,993	262,717	155	Australia	22.7	54,736	125,579	129
India	1.211	1,067,045	2,120,134	98	Malaysia	28.81	48,611	100,603	107

Sources: Authors Compilation

Indonesia, China, and India will account for about half of all new cloud-related jobs, adding more than seven million cloud-related jobs by 2015. While cloud computing is still just emerging as a computing style — IDC estimates that spending on public cloud IT services in 2011 was $28 billion, compared with more than $1.7 trillion in spending on total IT products and services — it already has begun changing how IT delivers economic value to countries, cities, industries, and small businesses. IDC estimates that last year alone, IT cloud services helped organizations of all sizes and all vertical sectors around the world generate more than $400 billion in revenue and 1.5 million new jobs. In the next four years, the number of new jobs will surpass 8.8 million.

CONCLUSIONS

According to the numbers mentioned in this paper, a few things are clear. First server virtualization has lowered the capital expenditure needed for deploying applications, but the operational costs have gone up significantly more than the capital cost savings making the operational long tail the costliest part of running servers. This year, 80-100 million virtual machine will be created. Infrastructure automation is becoming a central part of any model data centre. Providing infrastructure as a service will not be a nice to have but will be a requirement. Because the cloud provider is responsible for both hardware and software, firms may not have to acquire costly technology like servers or pay directly for computer or software application upgrades and updates. Firms also can save money because they no longer need extra space to contain the office servers and other IT. The efficiencies of cloud-based systems allow firms to raise their effective rates without having to hike their billing rates.

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