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ABSTRACT

Drawing upon the literature review and analysis of current published research, this paper identifies the issues in and highlights the importance of post-adoption stage. There has been a considerable amount of research undertaken which have studied different issues related to pre-adoption. The focus of majority of these studies generally lies in the exploration of research issues related to pre-adoption stage. Comparatively less attention has been given to understand the issues at post-adoption stage.

Exploring issues in Enterprise Information Systems Post-adoption Stage

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KEYWORDS

Enterprise information systems	Post adoption
Innovation	System support and maintenance

INTRODUCTION

The purpose of Enterprise Information Systems (EIS) is to connect and manage information flow within and across organizations. These systems allow managers to make decisions based on most up to date state of the business. EIS are integrated software applications that are implemented in an organization to automate complex transactions and improve overall organizational effectiveness (Davenport, 1998; Markus & Tanis, 2000). Historically these systems were installed to support back office tasks like integrating and automating complex transaction processes across company functions like finance and human resources (Davenport, 1998). Today, the functions of EIS have been greatly expanded to provide additional functionality such as customer relationship management, supply chain management, planning, performance management and advance analytics.

The research stream examining the adoption and use of EIS have evolved in to one of the most mature research streams in the Information Systems (IS) field (Jasperson, Carter, & Zmud, 2005; Venkatesh, Morris, Davis, & Davis, 2003). A great majority of the research efforts have been focused towards exploring pre-adoption behavioral and initial use factors. In recent years, EIS post-adoption behavioral studies have started to emerge in different IS publications but the main focus remains towards studying the same set of factors that lead to initial use and acceptance (Saeed & Abdinnour-Helm, 2008).

The purpose of this paper is to highlight the importance of post-adoption stage, identify research gaps in the literature, and explore academic as well as practitioner issues of this stage. An extensive literature review was conducted to describe the concept of post-adoption stag as perceived by previous research. This paper is an attempt to fill in the research gap and address practitioners concern by further exploring the area to better understand the issues associated with it. This paper assimilates knowledge from management and IS literature to fully describe and highlights issues in post-adoption stage.

This paper is organized as follow. First section includes literature review on post-adoption stage as perceived by previous research. Second section provides a detail on the conceptualization of post-adoption stage in EIS. Third section explains the issues related to post-adoption stage followed by further explanation on probable links between innovation and post-adoption activities.

LITERATURE REVIEW

Earlier studies have looked at the post-adoption stage from different perspectives. Some notable examples are from IS implementation literature that include IS implementation process model of incorporation (Kwon & Zmud, 1987) and routinization (Cooper & Zmud, 1990). These studies examine post-adoption behaviors at an individual level and establish its theoretical basis on the innovation diffusion theory. The innovation diffusion theory formulate on the basis that diffusion of innovation can be viewed as an ongoing process where features and output of early stages are different from later stages (Agarwal & Prasad, 1997). Furthermore, Roger (1995) explains that diffusion of innovation is a process whereby innovation is communicated to members of the social community through numerous channels over time. Similarly, IS implementation can be viewed as continuous effort to diffuse an implemented IS to members of the social community over time (Kwon & Zmud, 1987).

The first IS implementation process model consists of six stages: initiation, adoption, adaptation, acceptance, use and incorporation (Kwon & Zmud, 1987) as shown in Table 1. These stages are then revised by Cooper and Zmud in 1990. The new model eliminates the use stage and divide incorporation stage in two stages namely routinization and infusion.

IS Implementation Process Model (Kwon & Zmud, 1987)					
Initiation	Adoption	Adaptation	Acceptance	Use	Incorporation
IS implementation Process Model (Cooper & Zmud, 1990)					
Initiation	Adoption	Adaptation	Acceptance	Routinization	Infusion

Table 1: Two IS implementation Process Models

As shown in the Table 1, adoption and acceptance are two different stages in the implementation process. Adoption at an individual level implies a potential adopter's decision to whether to use or not to use IS. At an organizational level, this means organization's decision to designate and ensure resources needed for change. Also, at this stage, there is a possibility that a potential adopter may

have knowledge of the IS but do not have hands on experience in using any particular IS (Karahanna, Straub, & Chervany, 1999). The adaptation stage includes the process in which an individual or an organization goes through number of cycles to fully accustom with newly adopted IS. At this stage, users go through user training to fully understand the capability of the IS. The acceptance stage occurs after adaptation and entails an organization's devotion of efforts to persuade users to use implemented IS at work. At an individual level, this would mean increased productivity, work performance after adapting and accepting the new IS (Agarwal & Karahanna, 2000).

At the acceptance stage, users commit themselves to use IS and to gain experiences. Some variables like attitude toward use, and intention to use, can be employed to form the measurement of IS acceptance. Even though adoption and acceptance are two different stages in the IS Implementation Process Model, several theories that explain these stages do not provide clear differentiation. Some of the popular theories include theory of the reasoned action (Davis, 1989; Karahanna, et al., 1999), theory of planned behavior (Taylor & Todd, 1995), technology acceptance (Davis, 1989; Kim & Malhotra, 2005) and unified theory of acceptance and use of technology (Venkatesh, et al., 2003) .

Several studies including Bhattacherjee (2001), Bhattacherjee and Premkumar(2004) and Jasperson et al. (2005) suggest that an initial adoption and acceptance stages are very important, but true value and return on the investment can only be measured at the later stages namely routinization and infusion. According to Saga and Zmud(1994), routinization is a permanent change in the organization's governing system to accommodate for the newly installed IS. At the individual level, this routinization implies a standardized usage behavior that is treated as normal. In last stage of infusion, organization integrate IS at its fullest potential into management and operational processes (Jones, Sundaram, & Chin, 2002). This implies applying advanced and more features of IS to further enhance a more comprehensive set of tasks at the workplace (Saga & Zmud, 1994).

In summary, first three stages of IS implementation refers to activities at an organization or departmental level, and last three stages illustrate activities both at micro (e.g., an individual) as well as macro level. In particular, last two stages of the IS implementation can be envisioned as post-acceptance stage (Hsieh & Wang, 2007). Furthermore all the stages identified in Table 1 do not necessarily mean that these stages have to come in sequential way. These stages of IS implementation can occur in parallel as well (Saga & Zmud, 1994). Furthermore, different terms like post adoption / acceptance / implementation are used interchangeably in these studies.

Although previous section has explained post-adoption stage using IS implementation process model, it is important to understand this stage in EIS. The following section explains the concept of post-adoption in EIS followed by discussion on issues in this stage.

CONCEPTUALIZATION OF THE POST-ADOPTION STAGE IN ENTERPRISE INFORMATION SYSTEMS

The concept of post-adoption stage in the EIS was presented by Markus and Tanis (2000) in 2000 . They used a process theory approach to divide the EIS pre-adoption and post-adoption experience lifecycle into four phases (Markus & Tanis, 2000). The process theory argues that sequences of events leads to certain output stages, following a set of process. These four phases are shown in the Figure 1:

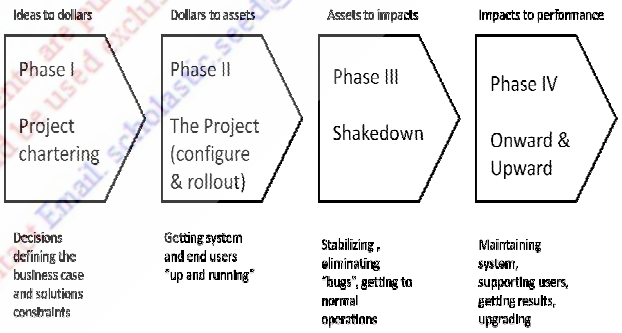

Figure 1: Enterprise Information Systems Experience Cycle (Markus & Tanis, 2000)

The project chartering phase consists of key decisions leading to funding of EIS. They suggest that some of the key actors of this phase include company executives, vendors, consultants, and IT specialists. Key activities include initiation of idea to adopt EIS, and identification and assignment of tasks to project champions. Additional activities

include the identification and selection of software and project scheduling and planning.

In the system configuration and rollout phase of a project, all activities are focused towards getting a system up and running in different organization units. Some of the key actors include project team members from different organization units, functional managers, vendors, IT specialists and consultants. All partners that are selected in the implementation of the project work closely with the project team to ensure that a project achieves the organizational goal of EIS implementation.

The shakedown phase refers to the period of time from when a system goes live until normal operation has been achieved. Some of the important key activities include errors or bug fixing, fine tuning the system, retraining additional staff members, and increasing staffing to handle the normal or temporary inefficiencies. In this phase, inefficiencies are realized to improve productivity (Markus & Tanis, 2000).

The onward and upward phase continues from normal operation until EIS is replaced with an improved, upgraded or a completely different new system. This is a stage when an organization discovers the true benefit of its EIS investment. Important people in this phase include end users, support personnel, and operational managers. Internal and external consultants and vendors may be also involved if upgrades are considered. Some of the key activities include the post implementation audits, benefit assessment and upgrading to new software releases.

Furthermore, Deloitte (1999) divides EIS implementation phases into three phases namely stabilize, synthesize and synergize. These three phases are also referred to as "second wave" implementation phase. In the first phase, organizations adopt a system and changes that occur due to this implementation. The second phase includes discovery of business benefits by the implementation of improved business processes and training of people to support new changes. The last phase, referred to as post-adoption stage, is where process optimization is achieved that results in business transformation.

The phases identified in Markus and Tanis's (2000) EIS cycle model are aligned with the stages of traditional systems development lifecycle (Nah, Lau, & Kuang, 2001) and IS implementation process models (Cooper & Zmud, 1990; Kwon & Zmud, 1987).

This study considers the post-adoption stage to be the same as the onward and upward phase and synergize phase as conceptualize in the case of EIS. The following section identifies research gaps related to post-adoption stage.

ISSUES AT THE POST-ADOPTION STAGE

There are several activities at the post-adoption stage to ensure that EIS continues to meet the business demand. Some suggest that these activities are complex in nature because of their dual nature of doing and managing character (Chapin, Hale, Khan, Ramil, & Tan, 2001). Nordstorm and Welander(2005) suggest two categories of these activities to capture the scope of post-adoption work. First category includes the activities that deal with the planning, managing and execution of change request. For example, a request to change, upgrade or fix a system by the customer. Second category includes all the activities that deal with providing the support. Some examples of these activities include providing support to users in problem situations, and, supporting the technology through which services are accessed. These activities are referred to as system support and maintenance (SSM) in IS literature.

SSM involves complex activities, both of the "doing" and the "managing" character (Chapin, et al., 2001). Khan & Zheng(2005) suggest that there is a need for "defined formalism describing various tasks, tools and methods are required" (pp. 7). Activities at the post- adoption phase are not only superficial operation work but could potentially link to the business pulses, i.e., the change of business environment or market climate via data maintenance in the decision support systems (Wang, Pauleen, & Ho, 2011). Some scholars suggest to explore the post-adoption stage and investigate the probable links with innovation (McElheran, 2011).

INNOVATION AND POST-ADOPTION USAGE BEHAVIOR

Prior IS literature suggests the degree of innovation depends upon level of IS usage at the post-adoption stage. Several studies including Schwarz (2003) and Sundaram et al. (2007) argue that level of innovation and learning increases with the utilization of IS in the organization. Here utilization refers to an extent at which the users integrate IS to support their work tasks. This study assimilates previous IS literature and identify key literature based on the type of IS usage and level of innovation. Table 2 presents empirical studies identified based on previous IS literature

IS usage level	Key Literature	Level of Innovativeness & Learning
Minimum	Routine/Standardize Use (Saga & Zmud, 1994; Schwarz, 2003; Sundaram, et al., 2007)	Low
Moderate	Extended/Deep structure Use (Burton-Jones & Straub, 2006; Schwarz, 2003; Swanson, 1994)	Medium
Maximum	Emergent/exploration Use (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, Agarwal, & Tanniru, 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006)	High

Table 2: Post adoption IS Usage Behavior

In the table 2, minimum IS usage refers to the user's utilization of IS in a standardized or routine manner that is compatible with standard work processes. Different terms like standard use (Schwarz, 2003; Sundaram, et al., 2007), routine use or normal use (Saga & Zmud, 1994) emerge in the IS literature for this concept. The key characteristic inherent in this type of IS usage includes common expectations from a user once IS implementation has reached to post-adoption stage. This expectation include but not limited to knowing how predefined set of rules, policy or regulations related to IS use, so that it can facilitate the integration between IS use and work processes (Saga & Zmud, 1994).

Moderate level of IS usage refers to user's utilization of more IS functions or features to support work task performance. Extant literature suggests that similar concepts that explain this level of IS usage include but not limited to deep use (Saga & Zmud, 1994), extant function or feature use (Burton-Jones & Straub, 2006). The key characteristic of this level of IS usage is that it includes utilization of IS features or functionalities to accommodate additional work task. This level comes during the post-adoption stage where user become more familiar with IS functions due to extended use. Empirical evidence suggest that this level further increase the user capability and enable them to perform their tasks in more efficient and effective way (Hsieh & Wang, 2007).

Maximum level of IS usage refers to a stage where level of innovativeness and learning is at highest level through the utilization of IS. Previous studies identify different terms like emergent use (Agarwal & Karahanna, 2000), exploration use (Nambisan, et al., 1999) , or innovation IT use (Ahuja & Thatcher, 2005) to explain this stage. The key characteristic of this stage include the utilization of IS in a fashion that go beyond the way that imparted by original implementer or designer (Jasperson, et al., 2005). Furthermore, this stage includes users utilization at maximum level where intention to explore, or try to innovate with IT is at highest level.

Although previous research has shown link between post-adoption and innovation (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, et al., 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006), there is little information available on the factors that influence innovation at post-adoption stage of EIS. Hence is important to explore this area and conduct additional research.

CONCLUSION

Previous empirical studies indicate that a post-adoption activity like SSM is often left to students, entry level workers or inexperienced personnel (Khan & Zheng, 2005; Polo, et al., 2003). SSM is not well regarded and a high staff turnover rate is common in support departments (Chapin, et al., 2001). The people who carry out this work may have few or no performance incentives attached to their work.

This paper explains the issues in post-adoption stage and highlights the importance of this stage. This area is considered important since it has the ability to provide a disruption-free environment and

the potential to support innovation in the organization. An extensive research is needed in future to further examine the potential effects and the role of post-adoption activities on innovation.

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Impact of ownership structure on e-recruitment practices in Banks in Sri Lanka

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ABSTRACT

This study aims to identify the relationship between nature of ownership and level of adoption of e-recruitment practices in banks in Sri Lanka. The main objectives of the study were to examine the levels of e-recruitment practices currently adopted and to be adopted in the near future, perceived constraints and motives of e-recruitment and the degree of managerial perception on e-recruitment practices, particularly in banking sector organizations in Sri Lanka, are among objectives. The study analyzed responses given by 46 managerial employees who are responsible for staff recruitment in the respective banks in Sri Lanka. The study revealed that the patterns of adopting e-recruitment practices among State Banks (SB), Local Private Banks (LPB) and Foreign Banks (FB) are varied, and LPB is toped. The study further revealed that though perception of HR practitioners, towards e-recruitment is positive in LPBs than FBs and SBs and perception among line managers and senior managers remain negative in all three sectors. Reduced time taken for hire and reduced administrative burden/paper work were identified as key motives while lack of knowledge and negative attitudes were identified as major constraints in practicing e-recruitment as a major source of recruitment in banking sector organizations in Sri Lanka. .

KEYWORDS

Recruitment	e-Recruitment,
Sri Lanka	Managerial perception
Banks	

INTRODUCTION

In the wake of the Internet's rapid expansion at the end of the twentieth century and its continuing success story at the beginning of the twenty-first, there is hardly a profession that hasn't been affected by internet and the World Wide Web (Blickenstorfer, 2006). In recent years, the internet has made an impact on the Human Resources field (Bussler & Davis, 2002) and some HR functions has developed commercially Recruitment is being assisted with higher involvement of the Internet.

HR practitioners are facing great challenges in hiring the most appropriate persons for the respective organizations within a short period while keeping the cost down. Here, there are two specific questions to be answered by HR practitioners;
Can the organizations allow HR practitioners 8-16 weeks (Yelland, 2002) for hiring a person for an important position, without badly affecting its business operations? How can HR practitioners reduce the period of time, without affecting the quality of hiring?
Organizations in today's increasingly competitive business world, such a delay in recruitment will make heavy disturbances or even on firm's existence and will have to compensate quality if it moves to quick hiring under traditional methods.

As a response to these challenges, in some countries internet based recruitment and selection systems called e-recruitment methods have been developed to reduce the cost and the time consumed for the hiring process while maintaining its quality (Byrne, 2000 Rembrandt, 2001; Walters, 2002; Yelland, 2002). It has achieved a significant level of success and now it is increasingly popular across the world (Evans et al., 2007; Holm, 2010; Marr, 2007).

Since the Sri Lankan economy too is affected by globalization, and the challenges in staff recruitment is not been much different in Sri Lanka from the global context, it's an emerging need to have more efficient systems like e-recruitment to be used in staff recruitment in Sri Lanka as well. However, until recent years it was hard to see any significant move towards internet based recruitment and selection systems (e-recruitment methods) being widely used in Sri Lanka. Even today, except for the corporate web sites of a few large organizations including multi-national companies and very few specialized web sites such as Topjobs (www.topjobs.lk), Jobsnet (www.jobsnet.lk) and Sri Lanka Job Bank (www.srilankajobs.net), many examples in practicing advanced e-recruitment methods in Sri Lanka cannot be seen.

In Sri Lanka, banking sector, being a prominent sector under the service category, can be identified as one of the leading sectors which is widely utilizing developments of ICT. Also it is expressed that Sri Lanka's ambition is to become the regional financial services hub for South Asia and has consolidated most technological advancements in that area. Such initiatives could be seen in corporate web sites of leading banks. However, it has not been witnessed that even the banking sector has utilized the full advantage of ICT for its non-operational (non-banking) activities including staff recruitment.

RESEARCH PROBLEM

HR professionals in many countries have been continuously researching on more efficient ways to perform organizational activities, incorporating the benefit of modern technology. The staff recruitment, as one of the most important managerial activities for the successful day-to-day functioning of any organization (CIPD, 2008) facing a challenge in hiring the most appropriate staff despite time/cost constraints. Therefore, the HR practitioners have to adopt emerging techniques such as Internet based methods which are among the most successful and increasingly popular such techniques (Evans et al., 2007; Holm, 2010; Marr, 2007) around the globe. Though e-recruitment methods are relatively modern practices (Byrne, 2002), relevant literature and surveys confirm that such methods are capable enough to take-up the challenge, by considerably reduce time and cost needed without compensating the quality of hiring (Byrne, 2000; Cappelli, 2001; Marr, 2007; Singh & Finn 2003 cited by Holm, 2010; Yelland, 2002).

Though there are many success stories in the global context i.e. *FedEx* , *KPMG*, *Reuters* (www.jeffgrout.com) in Sri Lanka, even in banking sector it appears that e-recruitment are neither widely practiced nor very popular among HR practitioners, but are still in their initial stages. However, such statements are not backed by strong evidence and it is needed to test, using empirical data which could answer the following questions, in respect of the banks in Sri Lanka;

1. What is the relationship between nature of ownership and level of adoption of e-recruitment practices in banks in Sri Lanka?
2. What is the degree of perception on e-recruitment, among HR practitioners who are responsible for staff recruitment in banks in Sri Lanka?
3. What are the future trends of Sri Lanka's banks relating to e-recruitment practice?
4. What are the critical factors which limit Sri Lanka's banks to practice e-recruitment as a major recruitment method?
5. What are the main drivers to adopt e-recruitment in banks in Sri Lanka?

LITERATURE REVIEW AND HYPOTHESES

As study done by IESE Business School in Spain (2001) on use of e-recruitment tools discovered that 51% of companies use e-mail as a recruitment tools, while owned corporate websites used only 44%. According to "*Recruitment practices and trends in Ireland* (2006)" done by the Public Appointment Services; 58% and 64% of Irish firms are using their corporate web sites and third party job websites respectively, among their recruitment practices. National news papers are used by 86% and rated by 30% as the main (top) recruitment method. 72% of public sector firms surveyed use the "corporate web site" as one of their major recruitment sources, while it is only 51% for private sector firms. Therefore, in Ireland, the level of adoption of the e-recruitment practices is different between public sector firms and private sector firms (Public Appointment Services, 2006).

However in Sri Lanka's context, as a whole the state sector is recognized as less IT-friendly. Until establishment of ICTA few years ago, the sector is hardly shown notable developments using Internet/WWW, when compare with advancements and innovations archived by the country's private sector. Here, it has been assumed that the same pattern can be seen in banking sector organizations too. The other hand, though number of technologically advanced and internationally reputed banks are operating in Sri Lanka, most of which are operating with one or few branches with very less number of employees. Probably, their staff recruitment function is neither very challenging nor need to adopt modern recruitment methods like e-recruitment. (e.g. Standard Chartered Bank – Sri Lanka, one of the two most popular foreign banks in Sri Lanka does not maintain separate web page for staff recruitment). Contrast, LPBs are fast growing in number of branches/employees. Based on the above literature it is hypothesized that

Hypothesis – 1**: There is a difference in the level of adoption of the e-recruitment practices between state owned (SB), local private (LPB) and locally operated foreign banks (FB) in Sri Lanka.**

H_{1a} – Level of adoption of e-recruitment practices in local private banks (LPB) is greater than state banks (SB).

H_{1b} – Level of adoption of e-recruitment practices in local private banks (LPB) is greater than foreign banks (FB).

Odumeru (2006) has done a cross sectional survey done in Nigeria, on the factor affecting the adoption of online recruiting technology using Rogers Diffusion of Innovation (DOI) Theory, and it was revealed that there is a strong relationship between attitude (or perception on relative advantages) towards e-recruitment and the use of the same. According to "Recruitment practices and trends in Ireland 2006" done by the Public Appointment Services (2006), views relating to online recruitment is positive among recruiters. Also 25% of Irish organizations are planning to enable candidates to complete applications online, while 34% of them are already facilitating it. Likewise, more companies are planning to adopt or upgrade more sophisticated e-recruitment practices. Also except "seeking candidates' feedback online", all other activities related to e-recruitment are expected to be increased in the future.E-recruiting has a limited ability to attract some types of job seekers because of lack of personal touch; lack of geographical targeting and all job seekers do not have internet access (Chang, 2001). So, e-recruitment may not be suitable for recruiting executive/top management level candidates (Arboledas et al., 2001; Arkin & Crabb, 1999; Brilliant People.com). e-recruitment tends to used only for junior positions and may not be suitable for recruiting executive/management level candidates (Arboledas et al., 2001). Such candidates still prefer personal contact (Arkin & Crabb, 1999) and concerned on data security issues relating to internet based methods. Therefore, e-

recruitment tends to be used only for junior positions and may not be suitable for recruiting executive/management level candidates (Arboledas et al., 2001; Brilliant People.com).

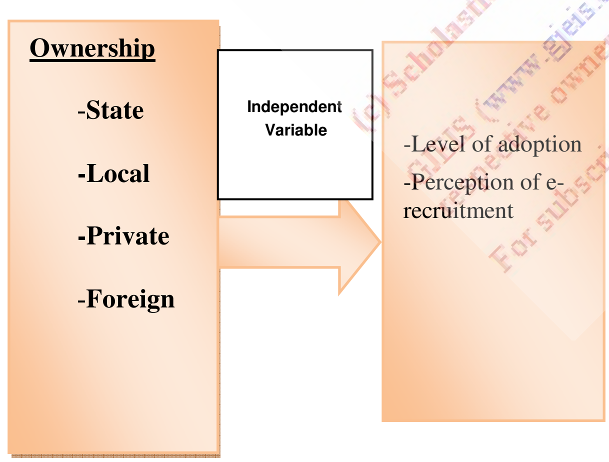
According to the finding of a survey conducted in Spain (IESE Business School, 2001) time saving for recruitment process (64%) is the main advantage e-recruitment. However, a report released in 2006 (Public Appointment Service, 2006), reduce recruitment cost (77%) was the main driver in Ireland. Ability to post jobs for job seekers internationally was ranked the top benefit of e-recruitment by Hamarna (2011) in the study done in Palestine. E-recruitment can eliminate a lot of paper work and speed-up the hiring process. (Richardson, 2000*).* The use of electronic recruiting instruments reduces the time invested in HR management by 25% to 30% (Blickenstorfer, M, 2006). E-recruitment achieves faster recruiting cycle through faster electronic communication i.e. faster posting jobs, receiving resumes, processing and screening fast. (Blickenstorfer, 2006; Othman & Musa, 2006). *).* Based on the above literature it is postulated that

Hypothesis – 2 **There is a difference in degree of perception on e-recruitment between state owned (SB), local private (LPB) and locally operated foreign banks (FB) in Sri Lanka.**

H_{2a} – **Degree of perception on e-recruitment is more favorable among managerial employees in local private banks (LPB) than state banks (SB).**

H_{2b} – **Degree of perception on e-recruitment is more favorable among managerial employees in local private banks (LPB) than state banks (FB).**

Figure 1: Conceptual framework



Banking sector is among the most ICT adopted sectors in Sri Lanka, consist of 22 LCB's and 09 LSB's. Managerial employees were selected for this empirical study as technology adoption theories emphasized that perception/attitudes managers is one of the major determinants of adoption of technological innovations like e-recruitment (Huy at el, 2012; Odumeru, Nigeria).

The sample; There were 93 questionnaires were distributed among managerial employees who are responsible for staff recruitment in LCBs and LSBs. Sent about three (3) questionnaires for Human Resources Departments of each bank and to be filled by randomly selected managerial employees engaged in staff recruitment in their respective departments. The rate of response and representation of banks/managerial employees in the sample as given in the table 01.

Table 1: Composition of the Population and the Sample (Banks)

	No of Banks represented each category			
	State Owned	Privately Owned (local)	Locally Operated Foreign Banks	Total
No of Banks in the Population	7	13	11	31
No of Banks represented in Sample	5	8	6	19
Percentage	71%	62%	55%	61%
	No of responses (sample)			
No of responses	19	18	9	46
Percentage	41%	39%	20%	100 %

METHOD OF DATA COLLECTION: PRIMARY DATA SOURCE

A questionnaire consists of MCQs and 5 point Likert scales was developed by the researchers used to collect data from respondents.

Mainly quantitative methods are used to analyze the data captured and present the research outcome. Statistical measures such as percentages, mean, mode, variance/standard deviation, t-tests, analysis of variance (ANOVA) have been used in data analysis. Since the study is to examine the behaviour, choices or perception towards e-recruitment practices, most of the data collected through the questionnaire was more qualitative (ordinal and discrete) in nature rather than quantitative (interval data or continuous data). However, in order to analysis results relating to number of questions/sub questions/statements (i.e. five-point Likert scale) or respondents as groups (i.e, state, local private and foreign banks) it has been frequently used central tendency measurements like Mean (Average). Also, when it makes comparison between groups of respondents or set of questions/statements, quantitative analysis methods have been used, considering the continuous/quantitative nature of such means.

Data Analysis and Testing of Hypotheses

Table 2: ANOVA (average responses between all three participants' groups)

ANOVA: Single Factor	α=	0.05				
SUMMARY						
Groups	*Count*	*Sum*	*Average*	Variance	SD	
State Banks	19	61.684	3.247	0.125900	0.355	
Local Private Banks	18	67.895	3.772	0.167551	0.409	
Foreign Banks	9	30.211	3.357	0.301779	0.549	
Total	46		3.474		0.477	
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-Value*	*F crit*
Between Groups	2.7045	2	1.35227	7.724003	0.001	3.214468
Within Groups	7.5281	43	0.17507			
Total	10.2327	45				

Source – Survey data

Table 2, shows that the results generated by one-way analysis of variance (ANOVA table), which test the equality of "average response given for 19 sub-questions/statements by survey participants in three groups i.e. state, local private and foreign banks". The table has illustrated a precise view of the responses given for question number 13, which consisted of 19 numbers of Likert type sub questions/statements aiming to measure the level of perception. The scale is from 1 (strongly disagree) to 5 (strongly agree) to the positive statements listed (Table 02 above). The table shows that average rating of 3.77 of local private, 3.25 of state banks and 3.36 for foreign banks while overall average rating stands at 3.47.

The ANOVA table confirms that the difference in average responses given by participants from three groups are statistically significant ($p<0.05$) at 95% confidence level, hence at least the average responses of one group of participants are differentiates from others.

Table 3: T-test – compare average responses, SB Vs LPB
Source – Survey data

t-Test: Two-Sample Assuming Unequal Variances	α=	**0.05**
Unequal Sample Sizes		
	State Banks	*Local Private (LPB)*
Mean	3.2465	3.7719
Variance	0.1259	0.1675
Observations	19	18
Hypothesized Mean Difference	0	
Df	34	
t Stat	4.162	
P(T<=t) one-tail	0.000	
T Critical one-tail	1.691	
P(T<=t) two-tail	0.000	
T Critical two-tail	2.032	

In terms of the survey data presented above, it is clear that more positive perception on e-recruitment

practices could be seen among managerial employees in local private banks (LPB) than in state sector banks (SB) and locally operated foreign banks (FB).

Table 4: T-test – compare average responses, FB Vs LPB

t-Test: Two-Sample Assuming Unequal Variances	**α=**	**0.05**
Unequal Sample Sizes		
	Local Private (LPB)	*Foreign Banks*
Mean	3.7719	3.3567
Variance	0.1675	0.3018
Observations	18	9
Hypothesized Mean Difference	0	
Df	17	
t Stat	2.006	
P(T<=t) one-tail	0.031	
T Critical one-tail	1.740	
P(T<=t) two-tail	0.061	

Source – Survey data

According to Table 4. Currently 85% of participants are accepting applications through E-mail and 70% post vacancy details in the web site/page, while 44% and 13% of them respectively are planning to do so. Also 59% of them are currently allowing candidates to forward resumes (e-mail) through their web site and another 15% of them are planning. 33% of them are planning to implement on-line self selection exercises (psychometric tests, writing ability … etc), though only 13% of them are currently using it. Also 24% banks are planning to have online application form to be filled and forwarded, on top of the 41% of them who are currently using it. When we consider all 19 activities listed relating to e-recruitment, an average of 30% participants is currently using them while we can expect the figure to increase up to 46% in medium-term.

Table 5: E-recruitment activities currently in-use and planned.

	Currently Use	Plan to Use	Total
a) Accept applications via E-mail	84.8%	4.3%	89.1%
b) Describe and advertise vacancies on web sites	69.6%	13.0%	82.6%
b) Post jobs on free Internet job boards/sites	21.7%	13.0%	34.8%
c) Have a dedicated recruitment website/page	47.8%	10.9%	58.7%
d) Post jobs on recruitment agency sites	45.7%	10.9%	56.5%
e) Respond to requests for further information on-line	45.7%	10.9%	56.5%
f) Let applications be forwarded through e-mail	58.7%	15.2%	73.9%
g) Applications completed on-line	41.3%	23.9%	65.2%
h) Build a database for future vacancies (computer based)	26.1%	17.4%	43.5%
i) Offer on-line self-selection exercises	13.0%	32.6%	45.7%
j) Initial screen on qualifications on-line	19.6%	26.1%	45.7%
k) Initial screen on competencies on-line	19.6%	8.7%	28.3%
l) Use personality tests at initial screen	10.9%	13.0%	23.9%
m) Use on-line testing at assessment stage	2.2%	21.7%	23.9%
n) Invite candidates to interview on-line	13.0%	10.9%	23.9%
o) Notify non-selected candidates on-line	23.9%	23.9%	47.8%
p) Make job offers on-line	10.9%	26.1%	37.0%
q) Give feedback to non-selected candidates on-line	8.7%	17.4%	26.1%
r) Seek candidate feedback on-line	4.3%	13.0%	17.4%

Source - Survey data

Therefore it can be projected that adoptions for e-recruitment practices among banks will be significantly improved in future.

According to Table 6, the majority (56%) of the participants ranked Lack of knowledge on e-recruitment applications as the main reason to limit the adoption of e-recruitment, while it was ranked among top three reasons by 73% of the participants. Respectively, 67% and 52% of the participants ranked Negative attitudes and difficulty in using for every position has been ranked as top three limitations. However limitations connected to data security and legal issues have been ranked among top three reasons by only 2.2% and 19.6% participants.

Based on the survey findings lack of knowledge could be identified as the main factor that limits adoption of e-recruitment practices among banks in Sri Lanka.

Table 6: Main Limitations

Limitation	Top1 -%	Top3 %
Lack of knowledge on e-recruitment applications	56.5%	73.9%
Initial investment is high	17.4%	21.7%
Factors relating to data security	2.2%	2.2%
Legal/policy issues	8.7%	19.6%
Difficult in using for every position	2.2%	52.2%
Lack of technological expertise	0.0%	28.3%
Negative attitude	13.0%	67.4%
Other	0.0%	0.0%

Source - Survey data

26% of the participants ranked Reduce recruiting cycle (i.e. time taken to hire) as the main factor which encourages adoption of e-recruitment practices, while Reducing administrative burden and Attract more skilful candidates are ranked among top three reasons by 17% and 13% respectively. However, 56%, 54% and 43% of the participants have respectively ranked Reduce administrative burden/paper work, Reduce recruiting cycle and Attract more skillful candidates among top 3 encouraging factors for e-recruitment practices.

Table 7: Main benefits of e-recruitment

Advantage	Top1 -%	Top3 %
Reduce advertising costs	10.9%	26.1%
Reduce recruiting cycle *ie* time taken to hire	26.1%	56.5%
Reduce administrative burden/paper work	17.4%	54.3%
Target a larger & more diverse candidate pool	8.7%	10.9%
Attract more skilful candidates (computer literate .etc)	13.0%	43.5%
Improve employer brand & image	0.0%	8.7%
Easy to build & manage candidate database	6.5%	13.0%
Reduce overall cost of recruitment	6.5%	21.7%
Because candidates prefer it	0.0%	0.0%
Other	0.0%	0.0%

Source - Survey data

Therefore, reduced recruitment cycle could be identified as the main driver encouraging the adoption of e-recruitment among banking sector organizations in Sri Lanka.

FINDINGS

The aim of the hypotheses H_{1a} and H_{1b} was to understand relationship between nature of ownership and level of adoption of e-recruitment practices in banks in Sri Lanka. Since it could be found that level of adoption of adoption of e-recruitment practices in local private banks (LPB) is greater than both state banks and foreign banks, the hypotheses H_{2a} and H_{2b} are proved. The lowest level of adoption could be seen in state banks (SB), while the highest level of adoption has been shown in local private banks (LPB) which lead FB marginally. However, FBs have not been ranked any of the e-recruitment methods among their top three. Among

the reasons that foreign banks reported less adoption level are that some of the foreign banks whose managerial employees were included in the sample operate in Sri Lanka having only one or very few branches with a limited number of staff (less than 100 and part of them are expatriates) and recruitments per annum is less than 25. Such banks were even reluctant to set up corporate web sites for Sri Lankan operations or add a separate recruitment page, whereas most local private banks whose staff strength is growing were willing to do so.

Compared with a survey done in Ireland, adoption to e-recruitment is more in the public sector than in the private sector organizations, which reports the use of corporate websites as a source of recruitment, is 72% in the public sector, while it is only 51% in the private sector. Overall popularity of e-recruitment in Sri Lanka's banking sector also appears relatively low and out of which company web site/page uses by 54% while third party websites used only by less than 30% of the participants. When compares with Ireland's, adoption for corporate web sites (i.e. 58%) is somewhat closed, but adoption for third party job sites are more than twice (i.e. 64%) in Ireland.

The survey data also confirms that e-recruitment practices have been widely used for recruit managerial/professional employees. However the finding is contradictory with the popular fact that the E-recruitment may not be suitable for recruiting executive/top management level candidates (Arboledas at el., 2001; Arkin & Crabb, 1999; Brilliant People.com).

The objective of the hypotheses H_{2a} and H_{2b} was to understand the degree of perception on e-recruitment, among managerial employees in banks in Sri Lanka. Positive perception has been reported in all 3 categories of banks (3 groups of respondents) while highest degree of positive perception could be seen among local private banks than state banks and locally operated foreign banks. Therefore, both H_{2a} and H_{2b} are also proved. However since the difference in degree of perception between state banks (SB) and foreign banks (FB) are statistically not significant, the degree of perception on e-recruitment among SB and FB could be considered as similar. Finding of state banks' less favorable perception on e-recruitment, confirms the popular fact that Sri Lanka's state sector is less ICT-friendly, while FBs' degree of perception on e-recruitment has largely affected by their very small scale operation (no of staff/branches) as explained above.

The other notable fact here is perception on e-recruitment among the line managers in all 3 categories of banks is negative while senior managers in state banks are also having negative perception. This situation is not only in Sri Lanka's banks but even in Ireland (Public Appointment Services, 2006) the negative perception among line managers could be seen (See table 2.17). Many research findings including TOE framework and Rogers' Innovation Diffusion Theory (IDT), confirm that attitude and perception of managers towards technological innovations like e-recruitment are among key determinants for adoption of new technology (Huy at el., 2012; Kim & Crowston, 2011). Here the perception/attitude of managers is negative, which may partly responsible for lower e-recruitment adoption.

Examine future trends relating to e-recruitment practices among Sri Lanka's banking sector organizations was one of the objectives of this study. The survey data confirmed that e-recruitment practices in the banking sector organizations in Sri Lanka are in a growth path. Higher degree of growth can be expected in recruitment of fresh graduates, clerical/secretarial occupations as well as recruitment of school leavers, than other categories of employment.

The survey data is revealed that the lack of knowledge as the most critical factor which limits practicing e-recruitment in banks in Sri Lanka. Also, recent study done in Sri Lanka on e-commerce implementation in Sri Lanka confirm that lack of knowledge among employees is a negative factor to implement e-commerce (which include e-recruitment as well), a technology innovation (SLBDC, 2002). Reduced recruiting cycle (i.e. time taken to hire) was found as the main drivers to adopt e-recruitment in Banking Sector organizations in Sri Lanka, similarly time saving was the main advantage at the study of IESE Business School in Spain. However, according to the survey done in Ireland, cost was the main driver, while ability to access diverse pool and reduce administrative burden ranked respectively at second and third. Lesser degree of economies of scale that could be enjoyed in Sri Lanka than in Ireland may be among many reasons that caused the difference in survey findings.

RECOMMENDATIONS

All most all banks are maintaining their own web sites. Those that have not separate section for recruitment of human resources, add separate section without delay in order to capitalize benefits of e-recruitment. In case that any bank don't have sufficient resources internally to manage its own, outsource by create a link to a third party recruitment site.

Despite of higher cost, the dominate position of national newspapers in advertise job vacancies was seen in the survey data as well. However it may be a practical idea to make the newspaper advertisement more precise as possible and invite readers/potential candidates to the web site/page for more details. (i.e. comprehensive vacancy information along with detailed job description, job locations, career path, salary and benefits, employment terms and conditions, company information, online application format with a facility to attach own resume etc).

Common recruitment web site recommends to be set-up by a recognized professional body (i.e. Sri Lanka Banks' Association, Association of Professional Bankers Sri Lanka … etc), exclusively for banking sector jobs. That can be further developed as a fully-fledged recruitment and assessment agency for the banking sector, which can obtain rating for psychometric, language, numerical or/and similar tests. So that it won't be necessary to invest every individual organization. Leading recruitment web sites like www.topjobs.lk and www.jobsnet.lk still does not offering sufficiently advanced e-recruitment tools like online interviews, online testing … etc, which can be add and can be become fully fledge e-recruitment service provider, beyond just a job vacancy advertiser and resume data base administrator. Also some reputed banks may prefer to have its own resume data base than sharing with common/third party web sites, probably due to data security concerns; therefore there will be IT/BPO firms specializing e-recruitment to be undertaken the management of such systems.

Since more e-recruitment activities can be expected in the future, more opportunities will also be opened for professional who are having higher degree of understanding on e-recruitment practices and strategies. In the other part of the world there are separate designations i.e. "online recruiters" "e-recruiters" introduced for qualified professionals in this area, therefore it is necessary to introduce a separate subject in the curriculums of professional HRM courses (i.e. Diploma level and above), then only there will be HR professionals with the sufficient knowledge in the area of e-recruitment.

Apart from that there should be frequent awareness programs conducted on e-recruitment practices, by way of seminars, training programs etc, this can be initiated by Institute of Personnel Management (IPM) or Institute of Bankers Sri Lanka (IBSL) … etc with the assistance obtain from international professional bodies like CIPD (UK), in order to make aware and update HR professionals and business strategists. Frequent awareness programs, experience sharing sessions and researches will help to dilute knowledge deficiency and negative attitudes, among the practitioners. Further the awareness programs which emphasized relative advantage, must be extended to senior managers and lime managers who can influence the technology adoption decisions, as some research findings confirmed that attitudes is largely determined by the perceived relative advantage of the technological innovation. (Huy at el., 2012; Odumeru; 2002)

Awareness should be improved among jobseekers (candidates) as well. Expansion of internet infrastructure and reducing the cost of it, as a result of stiff competition among key service providers, along with the increased proficiency in web application among educated youth, who are the potential candidate for the banking sector will, encourage any such initiatives. Also since internet access through (GPRS/3G/HSDPA) mobile phones becoming popular especially among young generation, it is important to be designed web portals suitable for such users (e.g. WAP). Then they can register with specialized job site and check whether any opportunity that matched with own resume.

Cost conscious companies/banks, apart from those time conscious, need to think of adopting some of the less popular e-recruitment activates like notify non-selected candidates and give them a feedback with escalating postage and printing costs.

CONCLUSION

The main purposes of this study were to understand relationship between nature of ownership and level of adoption of e-recruitment practices in banks in Sri Lanka. The sample of the study was randomly selected 46 managerial employees who responsible for staff recruitment function in 19 banks in Sri Lanka. Collection of data was done through specially designed questionnaire.

The findings of this study are important basically in practical aspect and also theoretical aspect by contributing to reducing the knowledge gap. Since the study explored that the main constraint for adoption of e-recruitment practices is lack of knowledge, through conducting specially designed programs as suggested, can mitigate such constraint in the development of modern e-recruitment practices. Also discussion on similar topics would stimulate IT professionals/enterprises towards e-recruitment as a potential e-business application; this study itself would be one of the key contributions.

The findings of this study would help both employers (i.e. organizations) and job seekers to adopt for less time consuming, less costly but more efficient recruitment practices, particularly in extremely competitive environments. In this highly competitive corporate world, employers may use e-recruitment practices in order to expedite recruitment and selection process without affecting its quality. Further some of the policy recommendations of this study may contribute to expand dimensions of the HR profession, particularly related to banking sector in Sri Lanka.

However, the study is basically on e-recruitment, relatively a new area, has not been subject to undergone frequent studies, especially in Sri Lanka context. The study investigate only in banking sector organizations which a part of service sector, and researched basically employers' point of views. Therefore it is important to carrying out further studies throughout different segments in order to generalize for Sri Lanka context, at least for service sector. Also it may be worthwhile to analysis case studies of some local companies which adopted for e-recruitment practices.

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Empirical study on obstacles in Information System Success

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ABSTRACT

To gain better competitive advantage in the market, the organization are using information systems. Most of the organizations either have established the information system or they upgrade their information system. But still there are lots of hurdles for gaining information system success. There have been a large number of analyses of critical success factors of information system projects in the literature, but there is shortfall in research efforts in studying failures globally and particularly in India. Therefore this paper attempts to study empirically the obstacles coming in Information system success. A questionnaire survey has been conducted to know the failures factors for not updating the information system timely. The survey has been done on two prominent telecommunication organization, one having successful IS (Reliance Communication) due to its continuous updation with respect to time, industry and executives other (Puncom, Mohali) don't have. As India is the second largest country in terms of mobile users in the world therefore the study of this industry is strategically and economically important due to its high potential for the growth of the country.

KEYWORDS

Information system (IS)	*Critical success factors (CSFs)*
continuous updation	*Indian telecommunication Industry*

INTRODUCTION

Information system is a suite having different software modules that integrates different functional departments in an organization. It provides the support for collaborating the different departments from planning, manufacturing to customer service, and finally to achieve the business goals. The market of various corporate information systems has grown tremendously. However, the implementation process of information systems is not only complex, but also organizationally disturbing and resource exhaustive. Many information system implementation projects gains incomplete success or the failures. The causes of failures are comprehensive which can be attributed to insufficient planning, stabilization, requirements and continuous updation of the system both at the business and project levels. Incompetent project management, minimum support from the corporate management etc. are also the contributory failure factors. The complexity in information system implementation has attracted much attention both from academic researchers and industrial practitioners. The reason behind this is that most of the studies conducted focus themselves on the success factors and neglect failure factors. Therefore study of the failures is equally important and yet not highlighted.

In this paper, the author attempted to discover the underlying critical success and failure factors of an information system projects if they are not updated continuously. A questionnaire survey of two information systems of telecommunication industry was conducted and analyzed.

LITERATURE REVIEW

The study [1] suggests that during the past two decades, investment in Information technology and Information system have increased significantly in the private and public sector organization whereas the rate of failure remains quite high.

The various factors responsible for IS failures [2] are:

- **Lack of top management commitment to the project;**
- Poor user commitment;
- Inadequate user involvement;
- Requirements not well understood;
- Failure to manage the expectation of users;
- Changing scope;
- Lack in skills;
- New technology;
- Insufficient Staffing;
- Lack of organizations' commitment to a systems development methodology;
- Poor estimation techniques;
- Inadequate people management skills;
- Failure to adapt to business change;
- Failure to manage the plan.

The **Standish Group prepared a report of a survey in which 365 [3] IS executives** participated. The reports suggests that IS/IT failures were covered up, ignored, and/or rationalized by IS/IT personnel. They advocate that the CEO's role in IS/IT planning and development should be:

- ✓ Quantify the business value of the IT by measuring its overall economic value to the business.
- ✓ Recentralize control of IT spending while maintaining flexibility.
- ✓ Communicate the results one expects in clear
- ✓ Financial terms.
- ✓ Keep the IT architecture/infrastructure simple.
- ✓ Be firm on rigorous pilot testing.
- ✓ Make sure that the new system has the capacity to handle the required number of transactions that need to be processed.
- ✓ Closely monitor what IT suppliers are using to run their own businesses.
- ✓ Avoid succumbing to hasty decisions based on the urgency of the situation.

New requirements are influencing the business processes as the business needs are changing very fast. Therefore to keep pace with the global market and to achieve the competitive advantage, the company has to react immediately and improve the quality of the adopted IS...

Turban et al. [4] reviews yearly Datamation (a leading practitioner journal of information systems) and then suggests why IS are important for a business organization.

The information systems are required for the following reasons:

- **For the business process reengineering.**
- **To meet the company's goals and objectives.**
- **Better decision making.**
- **For the development of the productivity.**
- **Enhancing the quality of the product.**
- **Building the competitive edge.**
- **Retention of change management environment.**
- **Creation of Research and Innovation environment.**

According to Turban et al. [4], the IS projects can be classified into four categories:

1) **Commercial e.g. customer relationship management (CRM), e-commerce, knowledge management**
2) **Strategic e.g. re-engineering, information architecture**
3) **Organizational e.g. centralization vs. decentralization, outsourcing, resource management;**
4) **Technological e.g. database, internet and intranet.**

Diniz [5], proposed a three dimensional model for the evaluation of virtual business environments from the user's perspective by doing the case study of three banks in a Brazil. The studies include the services offered, functionality, reliability, security of transactions on the sites and also the user's transaction quality. This evaluation approach is useful to known the quality of the sites used for Internet banking.

All the studies predict that during the past two decades, investment in Information technology and Information system have increased significantly in the organization. But the rate of failure remains quite high. Therefore an attempt is made to prepare the continuous updation model for the prediction of the success or failure of the organization taking into consideration the telecom sector. The current empirical study is particularly important as it may contribute in forming a model for the Indian telecom industry.

OBJECTIVES AND SCOPE OF THE STUDY

- **To study the causes of failures of ISs due continuous non-up gradation of IS.**
- **To study the critical success factors of continuous up gradation of IS especially for the Indian telecom industry.**

The objective of study is to analyze the failure and success factors of Information System due to non-up gradation and also pinpoint the most important factors. Also, the study focuses on testing the relevance of the factors existing in literature in the Indian Telecom Industry.

In view of the certain constraints like time and money, the study is confined to the two organizations, namely, Reliance Communication Chandigarh, Punjab Communication Limited, Puncom, and Mohali.

These enterprises are selected because they have extremely good business performance and high

Table 1.Sampling Plan

Organization	Management Level	Population	Sample	Actual Response	%age of response size
Puncom	Top Level	14	11	10	90.90
	Middle Level	20	14	13	92.85
	Lower Level	210	146	136	93.15
	Total	244	171	159	92.30
Reliance	Top Level	12	10	9	90
	Middle Level	42	32	29	90.62
	Lower Level	77	57	42	73.68.
	Total	131	89	80	84.76
	Grand Total	**375**	**270**	**239**	**88.53**

Employment generators and early adopters of IT with functional ISs. This industry is strategically and economically important for the growth of the country as India is the second largest country in using the mobile services in the world. Among these organizations, Reliance Communication is an upstream company concerned with telecommunication products and services. The other companies is also a telecommunication unit having manufacturing unit as well as service unit and are responsible for supplying finished products to consumers, i.e. the downstream company.

RESEARCH METHODOLOGY

A) For the Organization

a) Universe of study: Telecommunication industry comprises of Reliance Communication, Vodafone, Essar, Idea, and Bharti-Airtel.

b) Sample Selection: Reliance Communication Chandigarh, and Punjab Communication Ltd (Puncom) Mohali.

B) For the Respondents

a) Universe of study: All managers working at the three levels of the selected organizations.

b) Sample Selection: A number of respondents based on proportional stratified sampling from all of these organizations are selected. The respondents are identified from various levels / business functions in each organization such as top management, ARE management, functional heads, and ARE staff and users. The primary data is collected via questionnaires cum interviews with the selected respondents. Statistical Package for the Social Sciences (SPSS) statistical tool is used for the statistical analysis. The norms are formalized for the choice of respondents from the participating organizations on the basis of detailed discussions with a number of academicians, researchers and industrial experts. It is observed that increase in sample size will affect the results only marginally, whereas effort for it is considerable. The sample size from a stratum is determined on the basis of the following criterion:

70% of the population where sample size > 100
50% of the population where sample size < 100.

4.1 Data collection tools

Primary data has been collected through a questionnaire-cum-interview method from the selected respondents. The questionnaire is designed based on the literature survey, and detailed discussion with many academicians, professionals and industry experts.

INTRODUCTORY CONTINUOUS UPDATION COMPONENT

27 variables related to continuous updation of IS are selected for the study relating to failure and success factors of Information System. Quantitative analysis is performed by using various testing models, Anova F, T-tests are applied to check importance and to identify CFF & CSF between Puncom & Reliance.

Continuous Updation System

The analysis had been made on the basis of the mean scores. The responses of the managers of the two companies differ significantly in terms of their mean scores. Among these companies, Reliance Communication Ltd. has been pioneer in continuous updating full-fledged Information System (IS) with fully automated procedures, processes and practices. The Puncom has a function-wise domestic IS, that is not well-integrated. IS is only being used as a support tool by the Puncom managers. The Figure.1 explains the mean scores of both the companies.

From the mean scores, it can be depicted in Puncom there is very less up gradation in the ttechnology innovative factors that leads to its IS failure. Their market research at the global level is very low which its critical failure factor becomes. The project planning, monitoring factors are also very slow which leads to the failure of IS. However employee's awareness, knowledge, understands of advanced technology and methodology is found to be

sufficient in Puncom. This high managerial expectations are prevalent in Puncom because the company has been the player among the public sector telecommunication and managers of the company strongly feel that tremendous improvement in IS functioning should be done by updating the in-house IS to global IS.

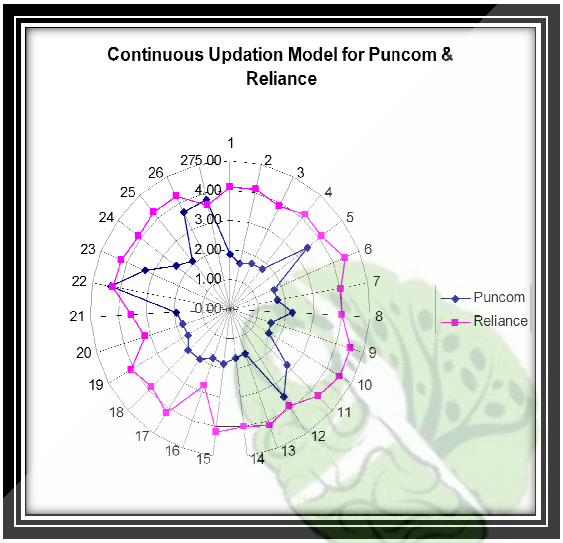

Figure: 1: Continuous Updation Model

The mean scores, also depicts that the managers of Reliance give maximum importance to the 'Marketing related' factors which leads to its IS success. However on other hand, the managers of Reliance do not have such high aspirations as the company has already has fully fledged Information System implemented. The global IS continuous updation in Reliance is found to be efficient as it has a potential for the decision making process.

5.1 Validity of the model

This has been tested by performing the following tests:

5.1.1 Measures of goodness

5.1.1.1 Content validity

The various views/sub-views and the factors / variables has been identified on the basis of extensive survey and study of literature.

The users of the Information systems has attained at the three levels of the management in the two participant organizations with rigorous consultation and discussions. This revealed that the questionnaire has been comprehensive and useful for the organizations.

5.1.1.2 Scale reliability

Reliability of the scale has been studied for Continuous Updation using Alpha method of scale reliability. The Cronbach's Alpha was calculated for both Puncom & Reliance which is discussed in detail in Table 2

As depicted from the table 2, the value of the Cronbach's Alpha was found to be greater than the standardized value of 0.6.This means the data is reliable. Hence both Puncom & Reliance had attained value of 0.811 & 0.822 respectively and overall 0.985. This establishes the reliability of the scale.

Table 2. Reliability of scale

	Puncom Reliance		Cronbach's Alpha Reliability		
Continuous Updation Process	No. of item	No. of item	PunCom	Reliance	Overall
	27	27	.811	.822	0.985

5.2 Continuous Updation Process for Information System

The respondent has been divided into three levels i.e. top level, middle level and operational level. Responses to factors and variable has given in the tabular form and also explained graphically. A conclusion has been drawn from these tables and graphs. Firstly the data have been tested by using mean Scores at top management, middle management and lower management level has been tabulated in table 3 and Figure 3 and Figure 4 for Puncom and Reliance. The responses of the managers of two companies differ significantly in terms of From Table 5.2 it was analyzed that the mean score of Puncom are near to 2 whereas in Reliance the overall mean is greater than or equal to 4. Further on the basis of mean score overall average of extremely important factors were identified in both the companies mean score. From the above results it had been concluded that Reliance has been sincere in continuously updating fully fledged Information System with fully automated procedures processes and practices .This shows that the variable identified as in table 3 are first planned then executed in the right direction whereas in Puncom there is a need for flexible model and still a huge scope of improvement & integration is possible.

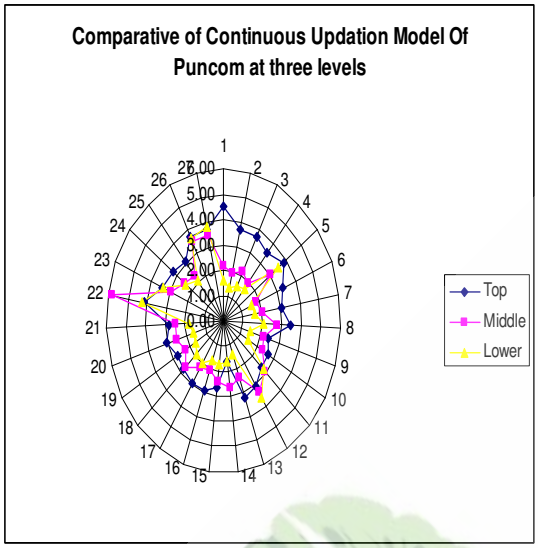

Figure 2 Comparative of Continuous Updation Model of Puncom at three levels

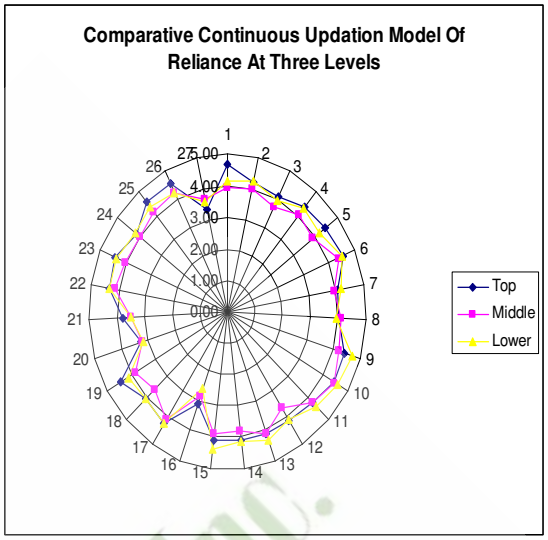

Figure 3 Comparative of Continuous Updation Model of Reliance at three levels

Table 4 Mean Scores (Puncom, Reliance,)

S. No.	Factor	Puncom				Reliance			
		Top	Middle	Lower	Tota	Top	Middle	Lower	Total
1	Price	4.50	2.15	1.63	1.85	4.67	3.93	4.12	4.11
2	Brand Image	3.70	1.92	1.38	1.57	4.22	4.00	4.26	4.16
3	Selection of	3.70	2.15	1.54	1.72	4.11	3.72	3.95	3.89
4	Market Position	3.50	1.92	1.64	1.78	4.33	4.03	4.26	4.19
5	Online and	3.80	3.00	3.47	3.45	4.44	3.86	4.19	4.10
6	Sales force	3.30	1.85	1.55	1.69	4.56	4.34	4.50	4.45
7	Delivery of	3.00	2.08	1.63	1.75	4.00	3.90	4.17	4.05
8	Flexibility to	3.40	2.77	2.07	2.21	4.00	4.10	3.95	4.01
9	Support	2.40	2.15	1.43	1.55	4.44	4.24	4.71	4.51
10	Quality to	2.60	2.31	1.44	1.58	4.44	4.45	4.60	4.53
11	Quality to	2.70	2.92	2.78	2.79	4.22	4.21	4.40	4.31
12	Quality of	3.10	3.31	3.60	3.54	4.11	3.59	4.05	3.89
13	RD centre	3.20	2.38	1.38	1.58	4.11	4.10	4.29	4.20
14	Market research	1.60	2.62	1.57	1.66	4.11	3.79	4.14	4.01
15	Market	2.60	2.38	1.73	1.84	4.11	3.90	4.38	4.18
16	Authority of	2.90	2.08	1.67	1.78	3.11	2.83	2.60	2.74
17	Clarity of	2.90	2.15	1.93	2.01	4.22	4.07	4.24	4.18
18	Formal and	2.80	2.69	1.90	2.03	4.00	3.59	4.00	3.85
19	Quality &	2.70	2.23	1.63	1.75	4.44	3.86	4.14	4.08
20	Information	3.00	2.54	1.60	1.76	3.22	3.21	3.14	3.18
21	Firm assests	2.80	2.46	1.79	1.91	3.78	3.48	3.50	3.53
22	Organizational	4.10	5.85	4.21	4.34	4.33	4.14	4.33	4.26
23	Marketing	3.40	2.92	3.35	3.31	4.44	4.03	4.33	4.24
24	Technological	3.20	2.54	2.38	2.44	4.11	3.93	4.14	4.06
25	Innovational	3.00	2.31	2.03	2.11	4.56	4.14	4.33	4.29
26	Marketing	3.70	3.54	3.67	3.66	4.56	4.21	4.24	4.26
27	Low cost	3.70	3.46	3.85	3.81	3.33	3.66	3.57	3.58

Factors	Top-Top		Middle-Middle		Lower-Lower	
	t	Sig. (2-tailed)	t	Sig.(2-tailed)	t	Sig. (2-tailed)
Price of IS	.383	.708	6.773	.000**	19.232	.000**
Brand actual	1.237	.241	7.372	.000**	22.930	.000**
Selection of services /products	.927	.371	5.059	.000**	16.023	.000**
Market Position	2.041	.063	7.941	.000**	27.152	.000**
Online and offline promotion/advertising and offline	2.421	.027*	3.595	.001**	6.613	.000**
Sales force	2.576	.022*	9.302	.000**	22.304	.000**
Delivery of products/services	2.301	.036*	5.395	.000**	23.431	.000**
Flexibility to support optimization of business procedure	1.309	.210	4.831	.000**	11.050	.000**
Support dynamically changing process	4.372	.001**	6.834	.000**	33.494	.000**
Quality to support products or services	3.945	.001**	8.092	.000**	29.347	.000**
Quality to support business efficiency and staff productivity	3.787	.002**	5.154	.000**	15.176	.000**
Quality of Communication in different	1.796	.090	.890	.386	2.889	.005**
RD centre	1.899	.075	4.870	.000**	21.763	.000**
Market research at global level for up to date IS.	6.049	.000**	4.276	.000**	17.938	.000**
Market research at global level for up to date IS (or worldwide) electronic presence of brands	3.640	.003**	3.744	.002**	18.968	.000**
Authority of the project manager actual	.459	.652	2.497	.025	9.459	.000**
Clarity of organizational goals	2.816	.012*	6.167	.000**	16.733	.000**
Formal and strict rules for employees	2.979	.009**	4.162	.000**	13.818	.000**
Quality & commitment of	3.712	.002**	5.871	.000**	16.739	.000**
Information exchange between the IS team and	.598	.558	2.493	.020	13.064	.000**
Firm assests actual	2.392	.030*	3.730	.001**	14.451	.000**
Organizational assets	.814	.428	-.746	.470	.929	.357
Marketing assets	3.576	.003**	5.098	.000**	9.458	.000**
Technological assets	2.705	.021*	5.910	.000**	13.323	.000**
Innovational differentiation	4.050	.001**	6.587	.000**	13.870	.000**
Marketing differentiation	2.988	.010*	2.093	.045*	3.300	.002**
Low cost strategy actual					-1.995	.052

Table 5

Table 5 t test for 3 levels of puncom and reliance

For the significant finding the difference in the three levels are calculated by using T-test as depicted in a table.4.

Hypothesis1 (H1): There is a significant difference in the levels individually(Top of Puncom to Top of Reliance, Middle of Puncom to Middle of Reliance, Lower of Puncom to Lower of Reliance) of the selected companies on the basis of mean scores (T-test).

Table 4 examined the differences existing in the two companies in context to ISs continuous updation activities... If the value of the significance is more than 0.05 those variables are not significantly contributing towards the model, it was found that the variables selected by application of T test at three different level of both the companies showed that the variables contributing are significantly different therefore alternate hypothesis is accepted. At various level variables identified are

Top Level: Online and offline promotion/advertising through IS, Sales force, Delivery of products/services, Support dynamically changing process, Quality to support products or services, Quality to support business efficiency and staff productivity, Research and development in the organization, national wide, actual, Clarity of organizational goals to employees, Formal and strict rules for employees to follow, Quality & commitment of Business & Product consultant of IS, firm assets, Marketing assets, Technological assets, Innovational differentiation, Marketing assets factors contributes significantly in the study .

Middle Level: Price, Brand Image, Selection of services/products, Market Position, Online and offline promotion/advertising and offline promotion/advertising, Sales force, Delivery of products/services, Flexibility to support optimization of business proc, Support dynamically changing process, Quality to support products or services, Quality to support business efficiency and staff productivity, Quality of Communication in different organizational units comm. actual, Research and development in the organization, Market research at global level for up to date IS at global level for up to date IS, Market research at global level for up to date IS (or worldwide) electronic presence of brands, Authority of the

project manager, Clarity of organizational goals to employees, Formal and strict rules for employees to follow, Quality & commitment of Business & Product consultant of IS, Information exchange between the

IS team and other employee, firm assets actual, Marketing assets, Technological assets, Innovational differentiation, Marketing differentiation factors contributes significantly in the study**.**

Operational Level: Price , Brand Image, Selection of services/products, Market Position, Online and offline promotion/advertising and offline promotion/advertising, Sales force, Delivery of products/services, Flexibility to support optimization of business proc, Support dynamically changing process, Quality to support products or services, Quality to support business efficiency and staff productivity, Quality of Communication in different organizational units, Research and development in the organizational , Market research at global level for up to date IS at global level for up to date IS, Market research at global level for up to date ISs(or worldwide) electronic presence of brands, Authority of the project manager, Clarity of organizational goals to employees, Formal and strict rules for employees to follow factors contributes significantly in the study.

Following are the observation for the three levels of Puncom and Reliance

(a) In Reliance, Chandigarh a full-fledged ERP based IS is in place and is fully operational and their business largely depends on it. The manual procedures, practices and processes have been largely replaced by the IS and the day-to-day working of managers is through the IS only.

(b) In Puncom, Mohali, some functional managers are the users of IS but not all the managers are well acquainted to using an IS. IT is more a support tool rather than a driver in the company. The in-house IS exists but more as function-wise and level-wise information systems that are not very well integrated.

Table 6 F scores of reliance and puncom

Factors	Reliance		Factors	Puncom	
	F	Sig.		F	Sig.
Price of IS	3.557	.033*	Price of IS	66.345	.000
Brand Image	1.069	.348	Brand Image	71.503	.000
Selection of services/pro	.835	.438	Selection of	45.282	.000
Market Position	1.839	.166	Market Position	29.930	.000
Online and offline promotion/a	3.443	.037*	Online and offline promotion/	5.930	.003
Sales force	.428	.653	Sales force	26.967	.000
Delivery of products/ser	1.611	.206	Delivery of products/s	12.781	.000
Flexibility to support optimization of business	.242	.786	Flexibility to support optimizatio n of	8.801	.000
Support dynamically changing	3.728	.028*	Support dynamicall y	12.301	.000
Quality of Communicat	.569	.568	Quality of Communic	18.331	.000
Quality to support	.718	.491	Quality to support	.262	.770
Quality of Communicat	3.348	.040*	Quality of Communic	1.072	.345
Research and	.462	.632	Research and	28.141	.000
Market research at	1.391	.255	Market research	10.205	.000
Market research at	3.041	.054	Market research	5.129	.007
Authority of the project manager	4.263	.018*	Authority of the project	12.756	.000
Clarity of organization	.335	.717	Clarity of organizati	7.137	.001
Formal and strict rules	1.997	.143	Formal and strict	14.894	.000
Quality & commitment	1.791	.174	Quality & commitme	13.560	.000
Information exchange	.086	.917	Informatio n	23.343	.000
Firm assets actual	.510	.602	Firm assets	14.762	.000
Organizational assets	.607	.548	Organizati onal	2.941	.056
Marketing assets	2.328	.104	Marketing assets	3.886	.023
Technologic al assets	.589	.557	Technolog ical assets	12.410	.000
Innovational differentiatio	.730	.485	Innovation al	9.005	.000
Marketing differentiatio	.395	.675	Marketing differentiat	.346	.708
Low cost strategy	.483	.619	Low cost strategy	4.152	.018

H2: Puncom & Reliance (Level-wise comparisons based on one way Anova F-Test) are significantly different in IS system Continuous Updation (ANOVA)

Table 6 examined the differences existing in the two companies in context to ISs continuous updation activities... If the value of the significance is more than 0.05 those variables are not significantly contributing towards the model ,it was found that the variables like Quality to support business efficiency and staff productivity, Marketing assets, Organizational assets, Clarity of organizational goals to employees are neither contributing in Reliance nor in Puncom. So these are excluded from the present study. Further variables whose significance

value is less than 0.05 were considered relevant for developing IS model as shown in table 6.

This proved that the model is significantly different in Reliance and Puncom as the alternate hypothesis was rejected.

Reliance Communication

Following factors play a great role in the Critical Success factors of IS in Reliance.

The various marketing related factors like information of the competitive services, prices and promotion of the products for the encouragement of the customers to purchase and negotiate through the IS in the global market is existing in IS.

In general, IS playing a great role in the online services for the delivery of products and services. IS supports various dynamically changing processes of the organization.

Quality of communication existing in the different organizational units through IS is very high. Every employee is answerable for their own domain of work through IS.

Authority of the project manager for updating the employees regarding the organizational goals from time to time is the normal activity of the Reliance.

This company provides a large services and product selection as the customers are more likely to find what they are looking for from the IS of Reliance.

Online and offline promotion/advertising have been encouraged through global IS because the majority of online vendors needed their trade immediately. An online ordering service allowed them to place an order at any time without waiting for a sales person.

Reliance has integrated their Information system with the web sites having their back-end operation, thus allowing customers to keep track of product availability and provide accurate information about it on their web sites.

Business clients also needed assurance that goods are available and would be delivered on time. It offers a services and products delivery anywhere in the world within 48-72 hours.

Employees follow the formal and strict rules for IS implementation.

The consultants of IS find to be highly committed to quality and the business product. Regular information exchange between the IS team and other employee leads to the success for IS failures.

Research and development centre is existing in the organization.

Market research at global level for up to date IS is in vogue. Nationwide (or worldwide) electronic presence of brands is available which is the continuously updated.

Puncom

Following factors play a great role in the Critical Failure Factors in IS of Puncom

- The various marketing related factors like information of the competitive services, prices and promotion of the products for the encouragement of the customers to purchase and negotiate through the IS in the global market is found to be missing.
- In general, a brand starts lagging in the global market and hence customer awareness declines. Due to non availability of the online services through IS for the delivery of products /services is missing as the organization is a public undertaking in which a lot of formal paper work is required to be processed in parallel.
- Sales force (marketing, promoting online services).Puncom rely on sales force rather than on the IS. Puncom should use its sales force, which had strong relationships with vendors, to encourage them to place orders through an online system.
- Puncom needs to form long-term relationship with vendors for facilitating the transition from the old to the new system, with strong customer support provided through the company's sales force and online training. Puncom required its vendors to change their purchasing system and practices.
- While vendors had to put more effort into learning how to use a new system to place online orders themselves, the sales force put more time and effort into developing marketing programs for them.
- Flexibility to support optimization of business processes using global IS is the requirement of current market. IS must support dynamically changing process to give the competitive advantage. But Puncom's IS lags in it.
- Quality of Communication in different organizational units is lacking in the in-house IS of Puncom.
- Research and development in the organization's R & D centre actual is just on cards and is not properly functional.
- Market research at global level for up to date IS is lagging.
- Worldwide electronic presence of brands is

missing.

- Authority of the project manager for implementing the new IS is lacking.
- No clarity of organizational goals to employees.
- Firm assets regarding the global ARE need to be employed in the organization.

RECOMMENDATIONS

Due to the high rate of failures of IS, it has been found that the organization which is lagging in IS online services, online customers, there is a real challenge in conducting business in the global market. They are not able to compete with other online competitors, therefore to convince customers to shop online or use online services some international standardized based IS for handing their business is required only then the company can have good business performance.
The researchers also observed that, Reliance is having a service-oriented culture than Puncom. Reliance encourages personal communication with customer services or sale personnel and develops relationships with them, and in return, their interests will be looked after in forms of extra care, extra service, and even discount.
This explains that the organization focusing its effort on customer service and customer relationships or human-touch activities. By providing a call center, sales support, and online chat, customers could have or maintain.

Direct communication with a company and feel that online shopping/business purchasing from Reliance is more personal and less individualistic processes. Besides this there is tremendous potential of further growth due to the introduction of 3G and Internet based Technology by the Reliance.

The study of this sector is of great importance for the employability, economic and business.

CONCLUSION

The study has identified and examined CSFs and CFFs related to continuous updation in the information system. The organizations must be highly concerned about that online security and privacy, their brand name recognition and reputation, customer support, relationship and delivery. Organizations need to understand the behavior of online customers.

The researchers found that all successful companies put effort into collecting customer profiles and conducting market research in order to understand their target customers. Organizations must support fully integrated IS development. As the survey is based on private(Reliance) versus public(Puncom)sector organizations, this studies concludes that the private sector organization are illustrious in their strength for gaining competitive advantage by having effective IS and hence the public sector organization must try to replicate the same.

This CSFs and CFFs guideline could also be applied to other developing countries with similar business and Information System related infrastructures and national culture mostly in developing countries.

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Global innovation index and its impact on GDP of BRICS nations- innovation linkages with economic growth: An Empirical Study

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ABSTRACT

Innovation is an important but challenging factor in creating and sustaining competitive advantage. In 2001, Goldman Sachs coined the term BRICs to describe the four large developing countries of Brazil, Russia, India, and China. The GII (Global Innovation Index) helps to build an environment in which innovation factors are evaluated incessantly, and it provides a key tool for refining innovation policies. The research work Undertaken is phenomenological in nature which attempts to explore the nostalgic and current trends in technological innovations in BRICS through our inductive approach and arrives at conclusion. Most of the information in the research work is from the secondary sources including books, journals, and accessible report data from foreign governmental or agential official websites. The paper embraces sensibly interconnected parts. In the first section of the paper, different Theoretical bases are analyzed to construct our own supposition. The second part discuss how BRICS is handling technological innovations to build innovation determined economy, while the third part explores the interrelationships between GDP and GII on its path to further ensue towards the proposed target. The final part deals with summary and conclusions.

KEYWORDS

BRICS	GDP
innovation	Technological
GII	R&D

INTRODUCTION

Throughout history, societies have leaded an extended path to attain economic development for the victorious ones and still extremely exigent for the laggards. If we take a moment of reflection upon the history of economic development of current modern human societies, we can establish that the process of industrialization and innovation has always been the key push in the creation of today's giant and powerful economies of Europe, the USA, Japan and many others. There has been an increased awareness and gratitude of innovation in the last two decades as a means to create and preserve sustainable competitive gain and as a key element of business triumph. The conventional resource based view asserts that competitive advantage rested on fundamental core values like innovations, quality, cost and timeliness Conversely, due to increasing global competitiveness and technological advances, innovation has become an imperative supplementary factor in creating and nourishing competitive advantage in a hastily changing business environment (Johannessen et al., 2001; Lee, 2009). Regrettably, managing the dicey and intricate process of innovation has been challenging (Hollins, 2000; Bueno et al., 2008) and not always managed well. Zaltman et al (1973). A variety of factors and approaches are used by different authors to measure innovation at different levels, such as the firm or the country level. Garcia and Calantone (2002) reveal that the terms "drastic, incremental, really-new, clichéd, sporadic, architectural, modular, recuperating, and evolutionary" have been used to define innovation. Johannessen et al. (2001) has suggests that the picture that emerges from these varied approaches underscores the point that a huge number of factors are interacting to tempt innovation in economic life". Lee (2009) concludes that while each factor remains vital, it is dubious by itself or as part of a group to endow with a sustainable competitive advantage".

It is based on the definition provided by Mashelkar and Prahalad (2010) that "An innovation is the implementation of a novel or considerably improved product, innovative process, innovative marketing method, or a new-fangled organizational system in business practices, workplace organization, or peripheral relations". The given definition forms the root of the Global Innovation Index (GII) developed by INSEAD in 2007.

THE GLOBAL INNOVATION INDEX (GII)

The Global Innovation Index by INSEAD is an international business school is a yearly publication of INSEAD which features the (GII), a combination of indicators that ranks countries/economies in terms of their enabling atmosphere to innovation and their innovation outputs. In 2012, its 5th edition was published by INSEAD and the World Intellectual Property Organization (WIPO) which is a specialized agency of the United Nations. This Index recognizes the role of innovation in augmenting the economic growth and opulence and acknowledges the calls for a parallel path of innovation which is pertinent to both developed and underdeveloped economies enclosing the indicators that go beyond the conventional measures of innovation like the research and development in a country. This Index has evolved into a precious benchmarking tool to smooth the process of public-private dialogue and policymakers, business leaders and other stakeholders can appraise growth on a recurrent basis. Alcatel-Lucent, Booz and Company and the Confederation of Indian Industry (CII) are the Knowledge Partners. These Knowledge Partners trust in the role of innovation in escalating the competitiveness of nations, enabling economic growth, driving societal changes and structuring the foundation of a country's future. They are dedicated towards producing a precious and non-partisan resource and also provide input to the research underlying the GII, contribute critical chapters to the GII Report and also support the propagation of results.INSEAD began its expedition to find enhanced ways to assess innovation in 2007.In 2011, WIPO united with INSEAD as a Knowledge Partners and at present it a co-publisher of Global Innovation Index. The 2012 edition places greater prominence on measuring economies' ecological sustainability and online creativeness.

In 2012 edition, 141 countries are ranked on the basis of their innovation capabilities and their output.This Index relies on two sub-indices - the Innovation Input Sub-Index and the Innovation Output Sub-Index, both the sub-index are built around pillars which further is categorised into three sub-pillars and each sub-pillar comprise of individual indicators, in total of 84 indicators. The GII 2012 explores the circumstances in which innovation embellishes and documents which countries are most triumphant in nurturing those conditions. Every year, the GII model is revised in a translucent effect. In GII report, 2012, Brazil, Russia and China were

ranked 58th, 51st and 34th correspondingly and India is positioned at the 64th position which is two notches below where the country landed last year. In India, the innovation front continues to be deficits in human capital, research, infrastructure, business superiority etc, it comes last among BRICS nations and in knowledge and know-how outputs, it comes ahead of Brazil only. The GII 2012 report remarks that the BRIC countries should invest additional in their innovation capabilities to attain expected potential.

IDENTIFYING BRICS NATIONS

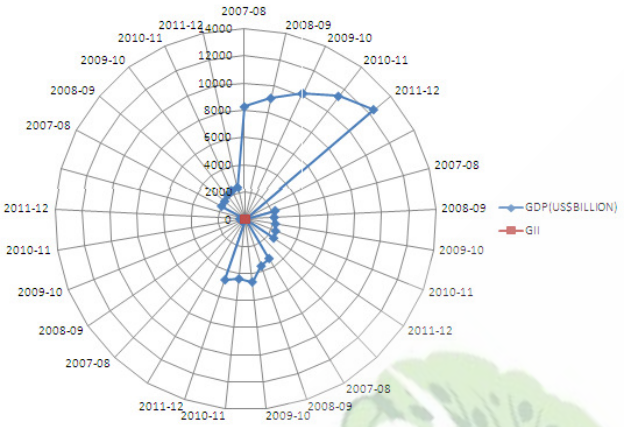
In 2001, the ellipsis BRIC was coined by Goldman Sachs, in a paper titled "Building Better Global Economic BRICs" which stated at the growth projection of the four leading rising economies that are ethnically and geographically incongruent. In 2010, a new acronym BRICS was introduced arising by adding South Africa into the original BRIC grouping and it symbolizes the combined economic power of Brazil, Russia, India, China, and South Africa. The BRICS account for more than 40 % of the global population and almost 30 % of the land mass. As of 2012, the BRICS nations represent approximately 3 billion people, pooled nominal GDP of US$13.7 trillion and an approximate US$4 trillion in combined foreign reserves. At present, the BRICS group is chaired by India. According to Hu Jintao, the President of the People's Republic of China, the BRICS countries are the defenders and promoters of developing countries and strength for world peace. Some analysts have highlighted probable divisions and weaknesses of this group like discrepancy of India and China over territorial issues, the failure to set up a World Bank-analogue development agency, and disputes over UN Security Council reforms between the members. Four economies are among the G-20 top ten, with China, India, Russia, Brazil, and South Africa in 2nd, 4th, 6th, 8th, and 26th place in terms of GDP at PPP respectively. China holds the 2nd position while Brazil, India, Russia, and South Africa hold the 7th, 9th, 11th, and 19th positions, respectively among the G20 members as per the criterion of GDP at market prices see

TABLE 1: GDP AND GII OF BRICS NATIONS FROM 2007-2012

YEAR	GDP(US$BILLION)	GII
	CHINA	
2007-08	8218.96	3.97
2008-09	9057.38	3.59
2009-10	10128.39	4.83
2010-11	11299.78	5.88
2011-12	12382.55	4.54
	RUSSIA	
2007-08	2276.47	2.6
2008-09	2118.14	2.93
2009-10	2237.4	3.03
2010-11	2383.31	3.58
2011-12	2511.7	3.79
	INDIA	
2007-08	3382.91	3.57
2008-09	3644.53	3.44
2009-10	4651.35	3.1
2010-11	4420.56	3.45
2011-12	4710.8	3.57
	SOUTH AFRICA	
2007-08	286.16	2.87
2008-09	275.27	3.41
2009-10	282.75	3.24
2010-11	363.7	3.52
2011-12	408.23	3.74
	BRAZIL	
2007-08	1996.28	2.84
2008-09	2001.6	3.25
2009-10	2186.53	2.97
2010-11	2294.17	3.77
2011-12	2365.87	3.66

Source: INSEAD Report

FIGURE1: GII AND GDP OF BRICS NATIONS



ECONOMIC GROWTH AND INTERNATIONAL INNOVATION INITIATIVES LINKAGES AND SPILL OVER

Several studies state innovation to be of pivotal importance in the feasibility and opulence of economies given the ever-increasing challenges of globalization and worldwide competition. Centre for Process Excellence and Innovation (CPEI, 2012) defines competitiveness as two capabilities: to innovate and develop cutting-edge technologies and products, and to install and to enhance the operational processes to manufacture and distribute these goods and services to the purchaser. Improvements in economic growth and the quality of life are supposed to be facilitated by invigorating and escalating technological innovation.CII (Confederation of Indian Industry) state innovation to be the only way for Indian industry to have sustainable and inclusive growth. Innovations are seen as the critical factor for job creation, growth and sustainable wealth generation in business firms and in the country as a whole (Goran, 2009).Technological capabilities, technology assimilation and dissemination are regarded to be the backbones of industrialization and international competitiveness without which it can be strenuous to build innovative economy (Dani, 2006).National Innovation System was first introduced by Freeman (1987) which implies energetic collaboration among industries, government institutions and universities whose interface results in overall augment in learning competence and innovative performance of the nation accordingly. Linsu (2000) remarks high rates of investments in physical and human capital to hoist modern planners, managers and engineers out of inexpert imitators of the 1960s. According to Technology Alliance Group (TA, 2012) to sustain a vivacious innovation economy, economies should aid an exceptional education system, sturdy research capacity and a vigorous entrepreneurial environment. (Richard, 2005) states that innovation remains knotty without a significant mass of financiers, entrepreneurs, and scientists, frequently nourished by world-class universities and elastic corporations. Establishment of Ministry of Science and Technology (MOST), Chinese Academy of Science (CAS) and National Natural Science Foundation of China and launch of different national programs like The Key Technologies R&D Program, 863 Program, 973 Program, The Spark Program and Torch Program and many other S&T oriented programs specify how China is desiring its Science and Technology capacity to raise. China's science and technology power is underpinned by the system of 5400 national governmental institutions, 3400 university-affiliated research institutions, 13000 research institutions under large state enterprises, and 41000 nongovernmental research-oriented enterprises. Over the last 30 years we can see manifest augment in scientific power of the nation: 293066 pieces of Chinese resident patent applications submitted to the World Intellectual Property offices around the world positioned China in the top position in the world in 2010.China's 15-year Plan of being innovation-oriented country until 2020 outlines numerous correlated policies including increasing GDP share up to 2.5 % into R&D sphere by 2020, raising the input of technological progress in economic growth to more than 60 %, restraining dependence on imported technology to no more than 30 percent of value added, becoming a top country in terms of invention patents and scientific papers citation gained by Chinese citizens (Denis,2007).India Innovation Initiative – i3, 2012 was communally promoted by Agilent Technologies, Department of Science and Technology (DST), Government of India(GOI) and Confederation of Indian Industry (CII) which aims to protract Innovation Ecosystem in the country by sensitizing, cheering and gratifying innovators and by facilitating commercialization.

India has emerged as an effervescent and resurgent economy in the recent years with ample capital formation, young and large human resource base, hastily escalating and vigorous infrastructure, fortunate information technology base, high GDP growth rates, rising and mounting domestic demand and a cosmic system of public funded R&D institutions. In spite of such a productive and favourable environment, the country has not been able to control its latent and potency towards technology and innovation driven sustainable growth path like other economies in the world. Israel spends more than 4% of GDP in Research & Development (R&D), Japan, South Korea; Scandinavian countries spend more than 3%. US, France, Germany spend more than 2%; China spends more than 1.50%. In India sum spending in R&D is around 1%, Government's spending is 2 to 3 times more than that of Industry's. In the 12th Five Year Plan, Government has rest a goal to twofold India's Gross Expenditure in R&D from its current level of 1% of GDP. Thus at the end of 2016-17, Government will elevate its own investment to 1% of GDP and will take adequate thought-provoking measures to raise private sector's investment to 1% of GDP. In order to rouse private sector's investment in R&D in 2007-8, an innovative pilot project named Global Innovation & Technology Alliance (GITA) was initiated by CII and the Department of Science & Technology (DST), Government of India.DST under its bilateral & multilateral Science & Technology Cooperation agreements with several countries launched industrial R&D programmes with Canada and Israel. In 2011, GITA has been institutionalized as a lawful entity and was incorporated as a private limited company under Section 25 of the Companies Act 1956 promoted together by CII and Technology development Board (TDB) of Department of Science & Technology, Government of India. CII and TDB hold 51% and 49% equity correspondingly in GITA. Its main objectives are to reinforce India's innovation ecosystem through supporting and enabling technology and innovation driven enterprises and to be an efficient institutional mechanism for providing end to end services and support for the materialization of an innovation ecosystem with demand pull for industrial innovation and technology start-ups. In November,2012,The National innovation council, chaired by Dr Sam Pitroda along with the World Bank organized a *Global Innovation Roundtable in which* the global innovation experts from 15 governments gave brainstorming session on the role of innovation in accelerating growth, development and welfare.China is the world's most outstanding emerging R&D hub, lifting its share of global R&D expenditures from 2007 to 2012 to reach about 14% of total worldwide R&D spending. China and India significantly boosted their share of global R&D spending, they doubled their spending from USD 100 to 200 billion (China) and USD 21 to 40 billion (India) from 2007 to 2012.Both the countries now account for almost 20% of global R&D spending. Movimento Brasil Competitivo (MBC) and the Brazilian Agency for Industrial Development (ABDI) punctuated the first-ever US-Brazil Innovation Summit in 2007, chaired by Robert W. Lane, Deere & Company – the Council on Competitiveness organized in 2008 and 2009 a series of 10 US-Brazil Innovation Learning Laboratories across both countries. The US-Brazil Innovation Laboratories have mapped the innovation ecosystems of the United States and Brazil, recognized key barriers and opportunities for change and collaboration and intended a policy strategy that will construct the competitiveness potential of both economies, as well as the Western Hemisphere. South Africa's untapped brains and knowledge network of expatriate assets will soon be activated resulting in increased competitiveness of the country for better realization of return on innovation and entrepreneurship. The SABLE (South African business link to experts) Accelerator was developed by three Global South Africans from Silicon Valley and London which features a core consulting team of influential South African expatriates holding senior positions at international technology(IT), life science and Agri-business companies, consulting firms as well as research and academic institutions, which is dedicated to help South African corporates, academic institutions and companies to commercialize technology innovations, to promote and protect intellectual property, funding of new business concepts and expansion into global markets. It will enable the "Innovators" from South Africa to register and post information about their intellectual property or new business models at the SableNetwork.com web site. This will result in links to Experts and sources of funding and business development support globally.India Innovation Initiatives helps India in becoming a leader in global innovation ranging from India's broader economic and institutional system with a precedence on promoting stronger competition among enterprises to give a free leash to innovation and tap innovative business ideas in India, to more specific areas like research and development (R&D) and intellectual property rights (IPR), foreign investment and technology transfer, grassroots innovation, testing,

quality services, education and skills, telecommunications infrastructure, high-speed research networks, and early-stage technology development. This initiative is principally driven by the development of science and technology and R&D. Innovation and competitiveness have a vibrant, reciprocated relationship, innovation thrives in a competitive environment and plays a key role in the accomplishment of such an environment. It generates fiscal value, new jobs in the economy and cultures of entrepreneurship and also promotes economic growth leading to inclusive growth. Considering BRICS nation's potential to innovate, the finest performance has not yet been achieved.

To achieve the objective of the paper, it is divided into following sections; Section I gives the insight of importance of innovations and economic growth with deep explanation of GDP and GII along with international innovation initiatives by the BRICS nations. Section II gives detailed Review of Literature, Data and Methodology is explained in Section III followed by Analysis and interpretations of results in section IV. Summary, conclusions and recommendations forms the part of section V and references are contained in the last section.

SECTION II: REVIEW OF LITERATURE

The following section gives deep insights of studies undertaken in India and abroad. Economists have been paying attention in the role of innovation in economic development or growth for a long time. The impact of innovation is treated as part of the Solow residual and therefore a key contributing factor to economic progress and long-term convergence (Solow 1957, Fagerberg 1994). Due to the recognition of endogenous growth theories, economists are increasingly of the view that differences in innovation competence and potential are principally responsible for continual variations in economic performance (Grossman and Helpman 1991). The effects of innovation on economic growth cannot be fully understood without taking into account the social and institutional conditions in an economy. Rodriguez-pose and Crescenzi (2008) state how the interface between research and social-economic and institutional conditions shapes regional innovation capacity. China has become the latest story of economic success and has enjoyed double-digit growth for three decades. China's policy makers are navigating the economy towards an alternative growth model in which knowledge and technology would play the key role due to resource constraints and raising costs. Consequently, innovation is becoming increasingly imperative and robustly promoted in the Chinese economy. It is reflected in numerous indicators. China's Research & Development expenditure as a percentage of GDP has unadulterated from 0.71% in 1990 to 1.52% in 2008 which is expected to reach 2.5% in 2020 (Schaaper 2009). The gap between China and the world's advanced economies in terms of R&D spending would be abridged considerably by then, as the latter usually spend about 2- 3% of their GDP on R&D. In China, the figure of domestic patents applied and granted grew from 69,535 and 41,881 items in 1995 to 586,498 and 301,632 items in 2007.The number of Chinese applications for patent registration also amplified from 13,510 to 107,419 with the number of granted patents rising from 3,183 to 50,150 during the same period. Between 1995 and 2006, the number of publications by Chinese scientists and engineers also increased from 7,980 to 71,184 according to the science citation index. The mounting role of innovation in China has fascinated the concentration of scholars both inside and outside the country. Wei and Liu (2006) reveal the optimistic impacts of R&D activities on productivity performance at the firm level and their finding is consistent with observations at the sector level by Wu (2006, 2009) who state that R&D contribution to productivity growth is statistically significant in manufacturing. Few authors also provide substantiation using cross-regional data (Kuo and Yang, 2008). Others mainly focused on firms within particular region (Hu and Jefferson 2004). Education has been a predominantly vital driver in the expansion of the capacity for technological innovation, as the experience of Finland, Korea, Taiwan, and Israel clearly shows. (Lopez-Claros, 2006).The above studies clearly identifies the importance of GDP and GII .The following paper gives the empirical relationship of GDP and GII in BRICS. China and Russia both try to prop up innovation growth through the support of state-owned enterprises. They seem to suppose that with the underdeveloped private sector, public companies are the only ones that have sufficient innovation capabilities and finance to take jeopardy in promoting S&T growth today. It is generally acknowledged that state-owned enterprises are quite incompetent in delivering concrete results with low levels of productivity and mounting corruption (Breznitz and Murphree, 2011; Klochikhin, 2012b).Both the countries have been developing a market-oriented patent system since mid-1980s when the foremost evolution took off. Today, China

has surpassed the United States in the number of patent applications even though the quality is still measured suspicious. Chinese assignees applied for 229,096 patents in 2009 as contrasting to the US 224,912 patent applications (Shapira and Wang, 2010; World Bank, 2012).

SECTION III: DATA AND METHODOLOGY

The data used in this study is secondary mainly taken from INSEAD Reports, publications, special reports and surveys, Government of India and many sources of RBI from the handbook of Indian economy. The period of study is from 2007-2012. Given the nature of the problem and the quantum of data, we first study the data properties from an econometric perspective starting with the stationarity of data. We employ cointegration technique to understand the causality in GDP and GII (Global Innovation Index). The time series stationarity of sample price series has been tested using Augmented Dickey Fuller (ADF) 1981. The ADF test uses the existence of a unit root as the null hypothesis. To double check the robustness of the results, Phillips and Perron (1988) test of stationarity has also been performed for the sample series. Descriptive of the data will be analysed to understand the nature of the data. Then VAR model will be employed which is a statistical model used to confine the linear interdependencies among the time series. VAR models generalize the univariate AUTO-REGRESSION models. All the variables in a VAR are treated symmetrically; every variable has an equation illuminating its fruition based on its own lags and the lags of all the other variables in the model. VAR modelling does not necessitate professional knowledge formerly used in structural models with concurrently equations. When specifying a VAR, one first has to decide which variables to include into the model. Since one cannot include all variables of potential interest, one has to refer to economic theory for any priori ideas when choosing variables. This involves some process of marginalization, in that the joint probability density of the VAR model must be interpreted as having been marginalized with respect to some variables that are potentially relevant (see e.g. Clements and Mizon 1991, or the discussion in Canova, 1995).Having specified the model, the appropriate lag length of the VAR model has to be decided. In deciding the number of lags, it has been common to use a statistical method, like the Akaike information criteria. Alternatively, one can choose a rather large lag length a priori, and thereafter check that the results are independent of this assumption (this is the approach taken in Blanchard and Quah 1989). However, a large lag length relatively to the number of observations, will typically lead to poor and inefficient estimates of the parameters. On the other hand, a too short lag length will induce spurious significance of the parameters, as unexplained information is left in the disturbance term. Forecasts from VAR models are quite flexible because they can be made conditional on the potential future paths of specified variables in the model. In addition to data description and forecasting, the VAR model is also used for structural inference and policy analysis. In structural analysis, certain assumptions about the causal structure of the data under investigation are imposed, and the resulting causal impacts of unexpected shocks or innovations to specified variables on the variables in the model are summarized. These causal impacts are usually summarized with impulse response functions and forecast error variance decompositions.

The stationary Auto regression Model

Let Yt = (y1t, y2t,. . . , ynt) denote an (n×1) vector of time series variables. The basic p-lag vector autoregressive (VAR (p)) model has the form

$$Yt = c + \Pi 1 Yt-1 + \Pi 2 Yt-2 + \cdots + \Pi p\, Yt-p + \varepsilon t,\ t = 1, \ldots, T \quad (11.1)$$

Where Πi are (n× n) coefficient matrices and εt is an (n × 1) unobservable zero mean white noise vector process (serially uncorrelated or independent) with time invariant covariance matrix Σ. For example, a bivariate VAR (2)

Once we have established the long run relationship between the variables of the VAR model, the next logical step for our purpose is to examine the Granger-causal relationship among the variables. X is said to "Granger-cause" Y only if the forecast of Y is improved by using the past values of X together with the past values of Y, than by not doing so (Granger 1969). Granger causality distinguishes between unidirectional and bi-directional causality. Unidirectional causality is said to exist from X to Y if X causes Y but Y does not cause X. If neither of them causes the other, then the two time series are statistically independent. If each of the variables causes the other, then a mutual feedback is said to exist between the variables. In order to test for Granger causality, we will estimate variable VAR model as follows, where all variables are initially considered symmetrically and endogenously. Then we have adopted the VAR Granger Causality/Block

Exogeneity Wald Tests to examine the causal relationship among the variables. An endogenous variable can be treated as exogenous under this system. The chi-square (Wald) statistics is used to test the combined significance of each of the other lagged endogenous variables in every equation of the model and as well as for joint significance of all other lagged endogenous variables in every equation of the model.

SECTION IV: ANALYSIS AND INTERPRETATION OF RESULTS

The following section gives the results and its interpretations relating to testing the relationship between GDP and GII in BRICS.

I) To begin the study the first step is to test the stationarity of data using ADF test first on actual data then on return series see Table 2.

TABLE 2: RESULTS OF STATIONARITY OF DATA

NAME	Panel-A		Panel-B	
	(ADF) Test	Phillips-Perron Test	(ADF) Test	Phillips-Perron Test
	T-Statistics	T-Statistics	T-Statistics**	T-Satistics**
GDP	-1.09	-0.51	-41.98 **	-41.98 **
GII	1.12	-1.38	-41.35 **	-41.32 **

Stationarity test of the variables used in the study, i.e. GDP and GII

II) After testing the stationarity of data the next step is to find the co-integration between the variables as variables were found to be non stationary which is a precondition to apply this test see table III.

TABLE III: RESULTS OF CO INTEGRATION BETWEEN GDP AND GII

Trend assumption: Linear deterministic trend
Series: GDP GII
Lags interval (in first differences): 1 to 1

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.526485	21.12447	15.49471	0.0064
At most 1 *	0.157081	3.930338	3.841466	0.0474

Trace test indicates 1 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.526485	17.19413	14.26460	0.0167
At most 1 *	0.157081	3.930338	3.841466	0.0474

Max-Eigen value test indicates 2 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The above results as shown in table III confirm the co-integration between GDP and GII as P value is significant at 5 % level of significance.

To find the causality in the two variables we use Granger Causality Test the results of which are exhibited in Table IV.

TABLE IV PAIRWISE GRANGER CAUSALITY TESTS

Null Hypothesis:	F-Statistic	Prob.
GII does not Granger Cause GDP	4.06697	0.0349
GDP does not Granger Cause GII	2.92676	0.0793

The results shown in Table IV confirm bidirectional causality between the two variables i.e. innovations lead to rise in economic growth and with economic growth innovation level rises as P- Value is significant at 5% level of significance.

SECTION V: SUMMARY AND CONCLUSION

The GII project was developed by INSEAD with the aim of determining how to discover metrics and approaches to incarcerate the affluence of innovation in society and go at the forefront of such customary measures of innovation. Innovation is imperative for driving economic progress of BRICS economies. BRICS need to refurbish their innovation drivers to achieve their expected prospective. Since 2008, the BRIC countries (Brazil, the Russian Federation, India, China and South Africa) have been seen as drivers of the global economic engine. But these countries too are slowing down regardless of their unrealized potential; they need to persist to invest in constructing their innovation infrastructures. China and India comes at 1st and 2nd place in the Innovation Efficiency Index rankings, correspondingly, indicating a great capability to decipher pockets of superiority in their innovation infrastructures into precious innovation outputs.

Conversely, both of these countries have weaknesses in their innovation infrastructures like ICT is poor in China and Human capital and research needs enhancement in India that must be addressed if these countries desire to recommence higher levels of growth and innovation. Brazil has suffered the prevalent drop among the BRICs which demonstrates the significance of addressing structural weaknesses in innovation ecosystems in the face of a global slowdown. Many governments are inculcating innovation in their growth strategies. Innovation is no longer constrained to Research & Development laboratories and publishing of scientific papers. Innovation could be further universal and horizontal in nature which includes both social innovations and business model innovations. Recognizing innovation in emerging markets is seen as crucial for inspiring people—particularly the next generation of entrepreneurs and innovators. GII helps in creating an environment in which innovation factors are evaluated persistently and provides a key device and rich database of comprehensive metrics for refining innovation policies. GII is more apprehensive in recuperating the journey for better measurement and understanding of innovation and in identifying embattled policies, superior practices and other levers to encourage innovation.

Results confirm the interrelationship between GDP and GII, as after testing the stationarity of data, co-integration between variables are tested, the results confirm the co-integration and after to test the causality Granger Causality is used which confirm bidirectional causality between the variables. There is a close relationship between per capita income rise, productivity, technology and has magical spill over. Countries should encourage innovative initiatives as this will give boost to rise to GDP. Following are the recommendations to strengthen the cross linkages between GDP and GII:

- To encourage the process of research more and more research institutions should be opened so that innovations can be initiated at the faster level.
- To initiate the faster development of innovations the pro active role should be played by state owned enterprises rather than private players as their main role is social welfare and not having commercial objectives.
- Ample opportunities should be provided to the people in their own territory as a result of which there is a brain gain rather than brain drain.
- More and more SEZs should be developed as because of these the spillover inter-linkages will be further strengthened.
- Domestic research has to be deepened to give us the solution of innovations and sustainability as FDI and knowledge spill over from the developed countries are not enough for innovative aided growth.

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A Study on Mobile phones - Brand Switching Pattern among the College Students of Delhi-NCR

ABSTRACT

The performed work is a modest attempt to study the Brand Switching Pattern among the College Students, for Mobile phones. The Studies performed in past [1][4-6], indicates that the potential and frequent consumers of latest mobile handsets are college going students. Thus, the performed work concentrates on the college going students, as the target audience for the study of the Brand switching pattern, related to Mobile Phones. The performed study uses the Questionnaire as a research tool, where Simple random sampling technique is used. Further, Information and Communication Technology (ICT) is excessively used, in all the phases of the Questionnaire analysis i.e. right from data collection to the data analysis and its presentation. The study concludes that mobile phone users i.e. college students, are frequently switching the brands, and it is found that Micromax is the upcoming brand, where as the Samsung is holding the second position; it is also identified that users are not preferring Nokia. the studied factors might be used by the companies to layout their future strategy, which could help them to have a sustainable growth in mobile sector.

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KEYWORDS

Brand Switching	Mobile Phones
Questionnaire analysis	Information and Communication Technology (ICT)

Empirical Article

INTRODUCTION

Indian mobile market is one of the fastest growing markets and is forecasted to reach 868.47 million users by 2013 [2]. The rapid growth and development in information technology and mobile devices has made the Indian mobile phone service markets more and more competitive. Mobile phones have become an integral part of human daily life and a major source of personal communication across the world [3].

Currently, the Indian Mobile phone market is severely flooded of the Chinese handsets; some local vendors are also landing in to the competition, either through in-house Research and Development(R & D) or through the labeling of their trademarks over the handsets, imported from China. Thus, the established brands are facing a tough competition, which can be analyzed by monitoring the Brand switching pattern of the consumer. The performed work is a modest attempt to study the Mobile phones Brand Switching Pattern among the consumers, specifically the college students. An empirical attempt is made; to analyze the variables that influence the brand loyalty behavior of the mobile phone users, to judge their satisfaction & dissatisfaction level and the impact of family members in the buying decision of mobiles by the consumers.

The Studies performed in past [1][4-6] , indicates that the potential and frequent consumers of latest mobile handsets are college going students. Thus, findings are entirely based on the research conducted on the college going students. The research analysis could be refined by considering the larger sample size, spread across other metropolitan cities in India. Further, for strategic formulation, the mobile companies are required to conduct such studies periodically; this will help them to gauge the exact consumer perceptions, which keep changing with time.

RESEARCH METHODOLOGY

The performed study uses the Questionnaire as a research tool, where Simple random sampling technique is used. A number of 300 College going students were randomly selected, among the selected, 276 students responded back, comprising 92% response rate for this study. The performed study utilized various tools of Information and Communication Technology (ICT) like GoogleDocs, Spreadsheet software (MS-Excel) for all the phases of the Questionnaire analysis i.e. right from data collection to the data analysis and its presentation. To assure the reliability of the conducted study, we targeted the educated sector of the community. The conducted study involved, data collection related to the qualification of not only the students but also of their parents, further the factors like family income level, parents occupation etc. are also considered. The purpose behind, is to assure that, the respondent understands the value of the given responses.

FINDINGS OF THE STUDY

Table-1 shows the demographical factors of this study. It is analyzed that the responses are contributed by the respondents who are reasonably qualified, 68% of the responses are from the students who are pursuing Post Graduation and 32% of the responses are from the students who are pursuing Graduation; and belongs to reasonably educated families. The statistics of the collected data discloses some interesting facts, like the responses are almost equally contributed by both genders, to be specific 54% of the responses are from masculine gender where as 46 % are from the feminine. Further, most of the respondents i.e. 55% belongs to the age group of 22-24 years. The Statistical analysis of the collected data reveals that most of the respondents i.e. 57% , belongs to the service class families.

Table-1 Demographical Factors of Respondents

DEMOGRAPHIC FACTOR	RESPONSE OPTIONs	PERCENTAGE
AGE	less than 18	3
	18-20	28
	20-22	55
	22-24	14
	more than 24	0
GENDER	MALE	54
	FEMALE	46
QUALIFICATION	GRADUATE	32
	POST GRADUATE	68
FAMILY OCCUPATION	SERVICE	57
	PROFESSIONAL	9
	BUSINESS	26
	OTHERS	9

Table 2 : Shows the respondent segment, who prefers for mobile brand change; the findings are based on the economic & Occupational status of the respondents family. The analysis of the collected data reveals that most of the respondents i.e. 57% , prefers for the change of their existing mobile brand, and they belongs to the service class families. Among the service class families most of the respondents belong to the families with monthly earning of 25000-50000 and 50000 to 100000 Rs Per month.

Thus the companies should target the needs of the service class, as they constitute the major component of their market. Further, the price band of the launched model should match their earning profile.

Table 2 : segment preferring for mobile brand change

Respondents class preferring for change of mobile brand	Percentage
Service class	**57**
Less than 25000	2
25000-50000	19
50000-100000	19
Above 100000	17
Professional class	**9**
25000-50000	3
50000-100000	6
Business class	**26**
Less than 25000	3
25000-50000	9
50000-100000	7
Above 100000	7
Others	**8**
Less than 25000	4
25000-50000	1
50000-100000	2
Above 100000	1
Grand total	**100**

Table 3 : Mobile Brand switching preference shift - Comparing the data related to the existing mobile brand under use and their next preferred mobile brand, the results reveals that the local mobile brand leaders and their Chinese counterparts has flooded the market. A drastic change in consumers brand preference is observed, the respondents are converging towards the local brands like MICROMAX and KARBONN, or other LOCAL/CHINESE brands, this leads to sudden fall in the brand choice for NOKIA and other established brands like SAMSUNG, BLACKBERRY etc. The worst effect is observed on NOKIA mobile handsets. MICROMAX is identified to be most preferred mobile handset Brand with 24% of the response share, and SAMSUNG is the next in line, with 20% of the response share.

Table 3 : Mobile Brand switching preference shift

MOBILE PHONE BRAND	% POSESSED BRAND	% NEXT PREFERRED BRAND
NOKIA	29	7
SAMSUNG	43	20
HTC	0	10
I PHONE	0	3
MICROMAX	9	24
KARBONN	3	5
BLACKBERRY	8	6
OTHER - LOCAL/CHINESE	8	25

Table 4 : Factors responsible for brand switching : The conducted study identifies that 46% of the respondents i.e. 127 out of 276, prefers for brand switching as outcome of the availability of "Better Quality at reasonable Price"; 35% of the respondents i.e. 96 out of 276, are switching for the sake of "Brand image", this statistics reflects that Local brands are also getting the popularity and they are identified as established brands, which is quite challenging for other established brands like NOKIA, SAMSUNG etc. Further, outcome of the collected data reveals that 16% of the respondents are identifying "Same or Better features at lower price" as the subsequent preference criteria.

Thus it can be realized that MICROMAX is giving tough competition to the well established brands like SAMSUNG

Table 4 : Factors responsible for brand switching

FACTORS CONSIDERED FOR BRAND SWITCHING	PERCENT
better quality at reasonable price	46
same or better features at lower price	16
service network	3
brand image	35
others	1

CONCLUSION

Based on the performed analysis of the collected responses, it is identified that the performed study reveals the details about the perception and the buying behavior of the respondents i.e. the students of the colleges from Delhi NCR region. It is analyzed that the responses are contributed by the respondents who are reasonably qualified, 68% of the responses are from the students who are pursuing Post Graduation and 32% of the responses are from the students who are pursuing Graduation; and belongs to reasonably educated families. The statistics of the collected data discloses some interesting facts, like the responses are almost equally contributed by both genders, to be specific 54% of the responses are from masculine gender where as 46 % are from the feminine. Further, most of the respondents i.e. 55% belong to the age group of 22-24 years.

The Statistical analysis of the collected data reveals that most of the respondents i.e. 57% , prefers for the change of their existing mobile brand, and they belongs to the service class families. Among the service class families most of the respondents belongs to the families with monthly earning of 25000-50000, and 50000 to 100000. This outcome enlightens an interesting pattern, that most of the students who belong to the service class families, whose income band is from 25000 to 100000 are quite prone to mobile change. This findings enabled us to find the pattern in further depth, where we analyzed for finding the facts related to the relation between the family income / family profession and present mobile brand/ Planned budget for next mobile/ next preferred mobile brand etc.

The mobile brand of Samsung is most preferred in the category of the existing mobile brand under use, 43% of the respondents i.e. 118 out of 276 are using the mobiles from Samsung. Mobiles from NOKIA falls next in the category of brands under existing use, it contributes to 29% of the respondents i.e. 80 out of 276. Comparing the data related to the existing mobile brand under use and their next preferred mobile brand, the results reveals that the local mobile brand leaders and their Chinese counterparts has flooded the market. A drastic change in consumers brand preference is observed, the respondents are converging towards the local brands like MICROMAX and KARBONN, or other LOCAL/CHINESE brands, this leads to sudden fall in the brand choice for NOKIA and other established brands like SAMSUNG, BLACKBERRY etc. The worst effect is observed on NOKIA mobile handsets. MICROMAX is identified to be most preferred mobile handset Brand with 24% of the response share, and SAMSUNG is the next in line, with 20% of the response share.

The conducted study identifies that 46% of the respondents i.e. 127 out of 276, prefers for brand switching as outcome of the availability of "Better Quality at reasonable Price"; 35 % of the respondents i.e. 96 out of 276, are switching for the sake of "Brand image", this statistics reflects that Local brands are also getting the popularity and they are identified as established brands, which is quite challenging for other established brands like NOKIA, SAMSUNG etc. Further, outcome of the collected data reveals that 16 % of the respondents are identifying "Same or Better features at lower price" as the subsequent preference criteria.

Analyzing the data for "factors considered for brand switching" in light of the data for "next preferred brand of mobile phone"; it is identified that MICROMAX is giving tough competition to the well established brands like SAMSUNG

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Understanding DIGITAL MARKETING

Marketing strategies for engaging the digital generation

By

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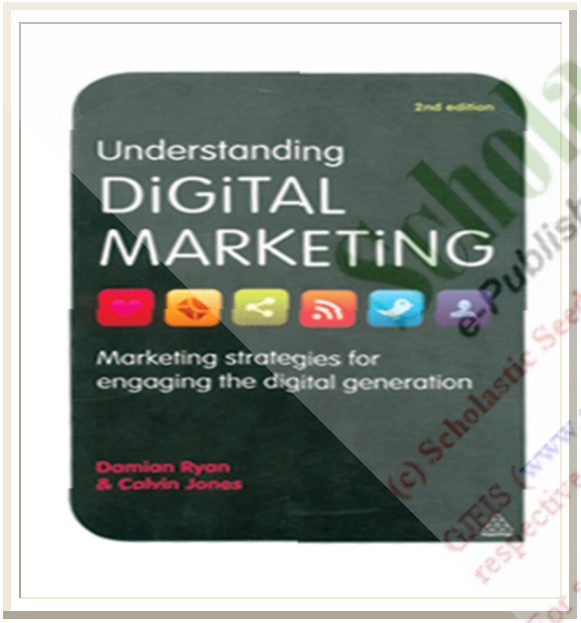
ABSTRACT

Understanding Digital marketing is an informative, practical and an easy to read book that takes you on a journey into the world of Digital Advertising. It helps the reader to understand how one can harness the burgeoning power of digital media to drive one's business to the crest of the digital marketing wave and sustain the same.

KEYWORD

Internet	Digital Marketing
Search Engine	Social Media
Mobile Marketing	Black Hat
Online PR	Affiliate Marketing



Today, the world is characterized by Digital Revolution that is taking place at a phenomenal pace. People are embracing digital technology to communicate in ways that would have been inconceivable a few years ago. Not only the techno-savvy but the ordinary people are embracing digital technology in their day to day lives.

In today's world, internet access has become practically omnipresent, and the widespread availability of always on broadband connections means that people are now going online to do everything from shopping to checking their mobile bills, bank statements, playing games etc.

This book will help the practitioner as well as students in unraveling the mysteries of digital marketing.

The book comprises a total of 11 chapters. Each chapter begins with a summary of its content. The book facilitates easy understanding of how to successfully use the internet to sell products and services.

The book begins with the origins of the medium and takes through the various disciplines of digital marketing campaigns.

The book helps the reader go through various facts, figures, comments and opinion from acknowledged experts, brands and organizations in different fields getting them to spill the beans on how net delivered goods for them.

Areas like search marketing, affiliate marketing, e-mail marketing, creative online executions have been delved by author in a very lucid way.

Various case studies at the end of each chapter lets the reader understand the concept through practical examples and real life situations and strategies adopted by organizations.

The authors takes us to understand the sinister side of digital marketing by throwing some light on its darker side and helping the reader to examine the world of 'black-hat marketing'.

Towards the end the authors discuss the key trends that are shaping the digital marketing landscape of the future; the evolving relationship between consumers and marketers; challenges the digital marketers will face in the next three years and what all one need to do to future-proof one's business.

Throughout the book the authors have avoided technical jargons wherever possible and have tried to present the information in plain, clear English. Wherever specific digital marketing terminology was unavoidable, a brief definition has been provided in the text itself. To supplement the definitions, a glossary is at the end of all the chapters which further enhances the knowledge even for a complete digital novice.

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The First-time Manager's Guide to Performance Appraisals

By

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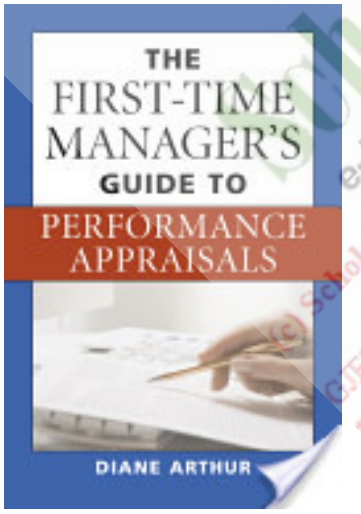
ABSTRACT

The First-time manager's guide to performance appraisals is a novice's guide to mastering appraisals. Conducting performance appraisals can be a daunting prospect especially for new managers. The book is a chock full of helpful ideas, insightful observations and handy tips which serve as an excellent guide for a newbie manager.



KEYWORD

Performance appraisals	Coaching
Counseling	Body language
Goals	Documentation

"The First-Time Manager", this helpful guide provides straightforward, useful information that will enable anyone to take on this important task of conducting performance appraisals with confidence and skill. It's ready-to-use tools including sample dialogues, phrases, and documents, as well as plenty of useful tips, "The First-Time Manager's Guide to Performance Appraisals" shows readers how to: review an employee's past performance; prepare for the face-to-face meeting; assess how successful the employee has been at meeting goals; set new objectives; help develop career plans; evaluate performers at every level; understand the importance of coaching and counseling throughout the year; write up the appraisal and use ratings; and, follow up effectively. This book is an essential resource for managers who want to get the most from the performance appraisal process and from their people.

Using the methods as discussed by Arthur in this book, one will be able to turn an experience that both managers and employees often dread into a positive and constructive one. The author's writing style is clear, concise and focused; she gets her points across with bulleted lists, sample forms and a list of 70 tips scattered throughout the book and then summarized in an appendix. Arthur proposes healthy focus on coaching, counseling and future development to new human resource managers and supervisors who must conduct regular performance appraisals.

First time managers usually have a lot of new things to try and learn very quickly. One of the most dreaded for most new managers is the performance appraisal. This is especially true if some of those you are evaluating were your peers before your promotion. Diane Arthur through her long experience in HR provides solid advice to the newbie manager. The book is divided into six parts comprising 16 short chapters.

You get advice that the real value in a performance review is not to pass judgment on last year's work, but to use that to manage the employee to grow and become more valuable in the coming year. She provides the 3 golden rules for performance reviews, and how you prepare for the next appraisal by coaching and counseling your employees throughout the year.

Author takes you through the preparatory process and how to get started on writing the review proactively, a month ahead of time so you have time to draft it, think about it, and rewrite it. That you have to gather documentary information from multiple sources to see things clearly and how to do it and why you should focus on objective measures rather than reacting subjectively to personal issues.

You are then guided through how to write the review, the tone you should use, and the dos and don'ts of performance review language. She gives you a seven step format for writing them up including letting the employee have enough room to respond to your evaluation.

The face-to-face meeting takes up four chapters because it is where the rubber meets the road. The key is to start right and create a supportive and comfortable atmosphere. The author takes you through what you should discuss to create a positive and constructive experience. You are also advised to speak no more than 25% of the time and to use active-listening, the other 75% of the time.

Arthur covers how to handle difficult employees. Her chapter on the typical performance appraisal pitfalls is also very insightful. The last section covers performance appraisals for employees of differing performance levels and how to manage those with different work arrangements such as telecommuters.

Effect of Scheduling rules on performance of Semi Automated Flexible Manufacturing System

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ABSTRACT

This work presents a impact of commonly used scheduling rules on performance of Semi Automated Flexible Manufacturing System. A semi automated Flexible Manufacturing system is low cost alternative to FMS, which provide most of features of Flexible Manufacturing System at an affordable cost. The performance of such system is highly dependent upon the efficient allocation of the limited resources available to the tasks and hence it is strongly affected by the effective choice of scheduling rules. Out of the many scheduling rules and processes, paper examines the most commonly used scheduling rules at different levels of Automation.

KEYWORDS

Flexibility	Flexible Manufacturing System (FMS)
Semi automated	Scheduling rules
Dispatching rules	

INTRODUCTION

The increasing demand for low cost, low-to-medium volume production of modular goods with many different variations creates the need for production systems that are flexible and that allow for small product delivery times. This leads to production systems working on small batches, having low setup times and mainly characterized by many degrees of freedom in the decision making process. This type of system is known as flexible manufacturing systems (FMS). Even though there is no single universally accepted definition of FMS, we are referring to the ones given by (Viswanadham & Narahari, 1992) and (Tempelmeier & Kuhn, 1993) as a production system consisting of identical multipurpose numerically controlled machines (workstations), automated material and tools handling system, load and unload stations, inspection stations, storage areas and a hierarchical control system. Considering the real-world circumstances and more practical approaches (i.e., number of workstations, different parts, variability, customization etc.), the definition of FMS can be referred to the literature study of (Young-On, 1994) on FMS performance

Flexible manufacturing systems (FMS) are production systems consisting of identical multipurpose numerically controlled machines (workstations), automated material handling system, tools and load and unload stations, inspection stations, storage areas and a hierarchical control system. The latter has the task of coordinating and integrating all the components of the whole system for automatic operations. A particular characteristic of FMSs is their complexity along with the difficulties in building analytical models that capture the system in all its important aspects. Thus optimal control strategies, or at least good ones, are hard to find and the full potential of manufacturing systems is not completely exploited.

SEMI AUTOMATED FLEXIBLE MANUFACTURING SYSTEM

In developing countries like India, it is often difficult to justify the high initial cost of Flexible Manufacturing System. It is therefore desirable, to look for low cost FMS versions that render most of its expected features, but at an affordable price. One-way to achieve this is by substituting the fully automated Flexible Manufacturing System with less expensive alternatives. These alternatives may result in some deterioration in performance and the same may be quantified. If the resulting investment cost reduction offsets the loss in performance then the low cost alternative may be preferred. Caprihan and Wadhwa (Caprihan and Wadhwa, 1993) termed this type of systems as Semi Automated Flexible Manufacturing System (SAFMS). The lack of computer based integration and automation in SAFMS are represented by different levels of delays present in the system in taking scheduling and dispatching decisions.

APPROACHES TO SCHEDULING IN FMS

The different approaches available to solve the problem of FMS scheduling can be divided into the following categories:

- **The heuristic approach.**
- **The simulation-based approach.**
- **The artificial intelligence-based approach**

This section deals with the above mentioned approaches one by one.

A very common approach to scheduling is to use heuristic rules. This approach offers the advantage of good results with low effort but is very limited since it fails to capture the dynamics of the system. The performance of these rules depends on the state the system is in at each moment, and no single rule exists that is better than the rest in all the possible states that the system may be in. Moreover, there is no established set of rules that is optimal for every FMS since the success of these rules obviously depends on the particular FMS at hand. Thus, it is known that some set of rules gives good results, but deciding which particular rules are the best for a particular configuration has to be done by trial and error. But the performance of these rules depends on the state the system is in at each moment, and no single rule exists that is better than the rest in all the possible states that the system may be in. It would therefore be interesting to use the most appropriate dispatching rule at each moment.

The other method of scheduling is Simulation .It is used extensively in the manufacturing industry as a means of modeling the impact of variability on manufacturing system behaviour and to explore various ways of coping with change and uncertainty.

Simulation helps find optimal solutions to a number of problems at both design and application stages of Flexible Manufacturing Systems (FMS's) serving to improve the "flexibility" level.

At an advanced stage, scheduling is also done by the intelligent systems which employ expert knowledge. In practice, human experts are the ones that, by using practical rules, make an FMS work to the desired objective.

This leads to the idea of a scheduling approach that mimics the behaviour of human experts, that is the emerging field of intelligent manufacturing (Parsaei & Jamshidi Eds, 1995). The literature offers different intelligent techniques for the scheduling of manufacturing systems. Namely, fuzzy logic systems (FLS), artificial neural networks (ANN) and artificial intelligence (AI) used in scheduling. AI based systems (i.e., more precisely expert systems) are useful in scheduling because of their ease in using rules captured from human experts.

HEURISTIC RULE-BASED SYSTEM FOR SCHEDULING

Heuristic approaches are the scheduling and dispatching rules that are generally used to schedule the jobs in a manufacturing system dynamically. Different rules use different priority schemes to priorities the different jobs competing for the use of a given machine. Each job is assigned a priority index and the one with the lowest index is selected first.

Many researchers (Panwalker & Iskander, 1977); (Blackstone, Phillips, & Hogg, 1982); (Baker, 1984); (Russel, Dar-El, & Taylor, 1987); (Vaspalainen & Mortan, 1987); (Ramasesh, 1990) have evaluated the performance of these dispatching rules on manufacturing systems using simulation.

The conclusion to be drawn from such studies is that their performance depends on many factors, such as the criteria that are selected, the system's configuration, the work load, and so on (Cho & Wysk, 1993). With the advent of FMS's came many studies analysing the performance of dispatching rules in these systems (Stecke & Solberg, 1981); (Egbelu & Tanchoco, 1984); (Denzler & Boe, 1987); (Choi & Malstrom, 1988); (Henneke & Choi, 1990); (Tang, Yih, & Liu, 1993);(Nof & Solberg, 1979) carried out a study of different aspects of planning and scheduling of FMS.

They explore the part mix problem, part ratio problem, and process selection problem. In the scheduling context, they report on three part sequencing situations:

- **Initial entry of parts into an empty system**
- **General entry of parts into a loaded system**
- **Allocation of parts to machines within the system**

They examined three initial entry control rules, two general entry rules, and four dispatching rules. Their conclusion was that all these issues were interrelated: performance of a policy in one problem is affected by choices for other problems. (Stecke & Solberg, Loading and control policies for a flexible manufacturing system, 1981) investigated the performance of dispatching rules in an FMS context.

They experimented with five loading policies in conjunction with sixteen dispatching rules in the simulated operation of an actual FMS.

Under broad criteria, the shortest processing time (SPT) rule has been found to perform well in a job shop environment (Conway, 1965). Stecke and Solberg, however, found that another heuristic - SPT/TOT, in which the shortest processing time for the operation is divided by the total processing time for the job - gave a significantly higher production rate compared to all the other fifteen rules evaluated.

Another surprising result of their simulation study was that extremely unbalanced loading of the machines caused by the part movement minimization objective gave consistently better performance than balanced loading. (Iwata, Murotsu, Oba, & Yasuda, 1982) report on a set of decision rules to control FMS. Their scheme selects machine tools, cutting tools, and transport devices in a hierarchical framework.

These selections are based on three rules which specifically consider the alternate resources. (Montazeri & Nan Wassenhove, 1990) have also reported on simulation studies of dispatching rules.

(Buzzacot & Shanthikumar, 1980) consider the control of FMS as a hierarchical problem:

Pre-release phase, where the parts which are to be manufactured are decided

Input or release control, where the sequence and timing of the release of jobs to the system is decided, and

Operational control level, where the movement of parts between the machines is decided.

Their relatively simple models stress the importance of balancing the machine loads, and the advantage of diversity in job routing. (Buzzacott, 1982) further stresses the point that operational sequence should not be determined at the pre-release level.
His simulation results showed that best results are obtained when:

For input control, the least total processing time is used as soon as space is available

For operational control, the shortest operation times rule is used.

In the study of (Shanker & Tzen, 1985), the formulation of the part selection problem is mathematical; but its evaluation was carried out in conjunction with dispatching rules for scheduling the parts in the FMS. Further, on account of the computational difficulty in the mathematical formulation, they suggested heuristics to solve the part selection problems too.

On the average, SPT performed the best. Moreno and Ding (1989) take up further work on heuristics (for part selection) as mentioned above, and present two heuristics which reportedly give better objective values than the heuristics in this (Shanker & Tzen, 1985), however, they are able to do by increasing the complexity of the heuristics.

Their heuristic is 'goal oriented' in each iteration, they evaluate the alternate routes of the selected job to see which route will contribute most to the improvement of the objective. Otherwise, their heuristic is the same as that of Shanker and Tzen.

When comes the real time scheduling of FMS, heuristic rules are often used. Practically, they can be used effectively, but they are short –sighted in nature. Due to the lack of any predictive and adaptive properties, their success depends on the particular plant that is under study and on the control objectives.

These rules refer only to some particular aspects of the scheduling problem, that is, to the ones of interest for the present study.

These rules are briefly presented here, for more precise descriptions the work of (Young-On, 1994); (Yao, 1994) and (Joshi & Smith, 1994) can be referred.

The heuristic rules are basically concerned with:

- Sequencing: that is, deciding the ordering of orders to be inserted into the system.
- Routing: that is, deciding where to send a job for an operation in case of multiple choices.
- Priority: setting for a job in a machine buffer: that is, deciding which will be the next job to be served by a machine.

Some sequencing rules are:

EDD (Earliest Due Date) : the first order that enters the system is the one with the earliest due date

- FIFO(First In First Out) : the first order that enters the system is the one that arrived first
- LPT(Longest Processing Time) : the first order that enters the system is the one with the longest processing time
- SPT(Shortest Processing Time) : the first order that enters the system is the one with the shortest processing time.

Some routing rules are:

- RAN (RANdom) : the next workstation is randomly chosen
- SQL (Shortest Queue Length) : the next workstation is the one with the shortest queue length
- SQW(Shortest Queue Workload) : the next workstation is the one with the shortest queue workload (the queue workload is defined as the sum of the processing times required by all thejobs waiting to be processed)

Finally, some priority setting rules for jobs in a machine buffer are:

- EDD (Earliest Due Date) : the first job to be processed is the one with the earliest due date
- Earliest FIFO (First In First Out) : the first job to be processed is the one that arrived first
- HPFS (Highest Profit First Served) : the first job to be processed is the one that gives the highest profit
- LIFO (Last In First Out) : the first job to be processed is the one that arrived last
- LS(Least Slack) : the first job to be processed is the one with the least slack
- MDD (Modified Job Due Date.) : it is a modified version of the EDD
- MODD (Modified Operation Due Date) : it is another modified version of the EDD
- SPT (Shortest Processing Time) : the first job to be processed is the one with the shortest processing time (on that operation)
- SPT/TPT (Shortest Processing Time/Total Processing Time) : the first job to be processed is the one with the lowest processing time (on that operation) to total processing time ratio

MOTIVATION FOR STUDY

The motivation for study is derived from the idea that most of the research work focuses on highly flexible and highly automated flexible Manufacturing system but very little work has been done on the kind of system that Small and medium industries are using. Most of these industries have partially automated flexible automation.

INDUSTRIAL IMPLICATIONS

Scheduling is the process of organizing, choosing and timing resource usage to carry out all the activities necessary to produce the desired outputs of activities and resources. In a manufacturing system the objective of scheduling is to optimize the use of resources so that the overall production goals are met. A heuristic based Scheduling Model for SAFM system is aims at making best use of available resources for SAFMS environments.

5.0 Operating environment and problem definition:
To study the performance of SAFM system , we have studied a number of automobile industries in and around Delhi and we have selected one industry from Northen India.

The industry supplies automobile components to many automobile industries like General motors, Maruti, Hero Honda etc. The machine shop set up includes 104 machines, which includes both CNC as well as conventional machines. We have taken a cell of 6 CNC machines for our study. These machines are connected by conveyor belt and decision are taken centrally. It takes some finite time to take decision and implement it.

THE SIMULATION SETUP

We have taken 6 parts for machining operation. Each part requires 4 to 6 operations. The processing time for machining of part varies from 40 minutes to 100 minutes.

Each machine is capable of performing different operations, but no machine can process more than one part at a time. Each part type has several alternative routings. Operations are not divided or interrupted when started. Set up times are independent of the job sequence and can be included in processing times. The scheduling problem is to decide on which rule should be selected for given amount of decision delay. The simulation model has been developed in Java. The results have been verified by hand simulation and comparison with WITNESS.

THE EXPERIMENTATION AND RESULTS

Three sets of data are entered as input to the model. Following assumptions are made

Case 1: Routing Flexibility : Part can be machined on 6 alternate machines
• Machine Flexibility : Very high
• No. of part processed : 1000 parts
• Dispatching rule : MinQ
• Parameter Varied : Review period delay and Sequencing rules

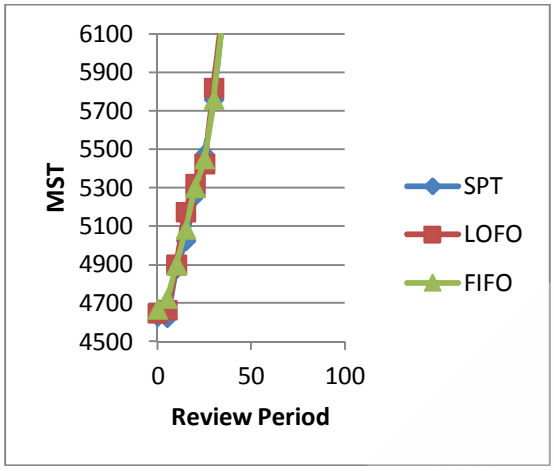

Figure- 1: MST vs Review Period at different Sequencing rules

Analysis of the result: From the fig-1, it can be seen among three rules SPT performs best at real time, but in case of review period delay beyond 20 min FIFO perform well as compare to other rules.

Case 2: Routing Flexibility: Part can be machined on three alternate machines (RF=3)
• Machine Flexibility: Very high
• No. of part processed: 1000 parts
• Parameter Varied: Review period delay and Sequencing rules
• Dispatching rule: MinQ

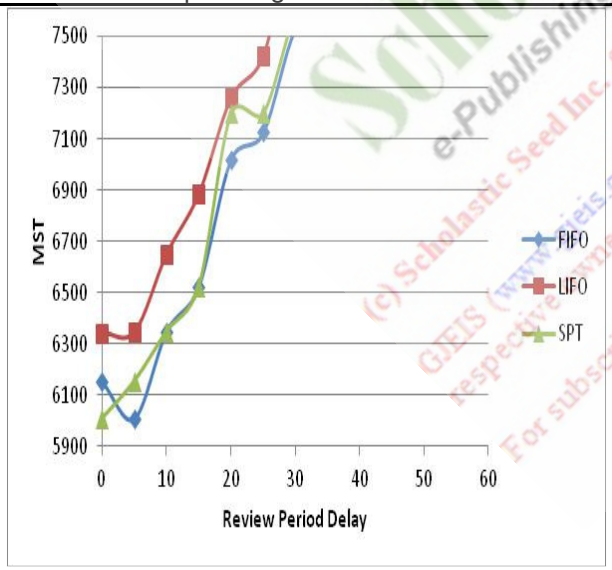

Figure- 2: MST vs Review Period at different Sequencing rules

Analysis of the result: From the fig-2, it can be seen among three rules SPT performs best at real time, but in case of review period delay beyond 5 min FIFO perform well as compare to other rules.

Case 3: Routing Flexibility : Part can be machined on two alternate machines (RF=2)
• Machine Flexibility : Very high
• No. of part processed : 1000 parts
• Parameter Varied : Review period delay and Sequencing rules
• Dispatching rule : MinQ

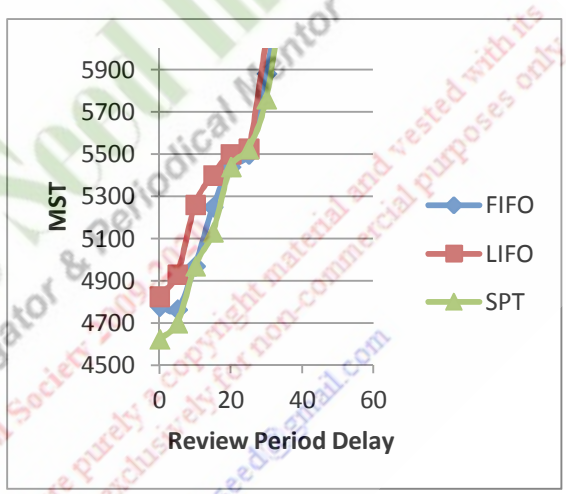

Figure- 3 : MST vs Review Period at different Sequencing rules

Analysis of the result: From the figure 3, it can be seen among three rules SPT performs best at all the levels of review period delays. However at higher levels of delay performance of FIFO and SPT are comparable.

CONCLUSION

In this paper, we have reviewed various approaches of scheduling FMS. We have taken special case of small and medium industries using Semi Automated flexible Manufacturing system. We have taken most commonly used heuristic scheduling rules for such system. From our simulation result at various levels

of flexibility and automations, we find in most of the cases SPT performs the best at real time, but at higher levels of delays, performance of SPT and FIFO are comparable. The study also suggests that there is no particular rule, which performs best under all operating conditions.

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Ground Station Software: *A Dynamic and Scripted Approach*

ABSTRACT

In the satellite world, there are many pieces of software used to control ground stations. Several iterations of such software exist, mainly as the result of research projects either by universities or the government. Unfortunately, these pieces of software all repeat common mistakes and little improvement in the software is made. The main goal of this paper is to provide an outline for a reusable and extensible application for the manual and automated control of networked ground stations. Essentially, the focus of this project is to address the problems perceived in existing ground station software. These problems are generally addressed through the use of a dynamic language, an object-oriented approach (everything, including primitive data types, is an object in Ruby), and the fact that the program is essentially open source because it is written in an interpreted language.

KEYWORDS

Ground station	Ruby
Scripted approach	GUI

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INTRODUCTION

Many diverse solutions exist in the field of ground station software. However, almost all of these have failed to gain widespread acceptance and use. In other fields, software solutions see large re-use because they sufficiently address the issues at hand and provide the necessary features to accomplish a certain job. Existing ground station software fails to do that. Current trends favor unnecessarily complex code written with static languages which are not well-suited to the job. Specifically, many existing software solutions use a modular framework to facilitate re-use and flexibility. However, the modular framework isn't ideally implemented in a static language environment due mainly to its complexity and somewhat to its inefficiency. Successful software must focus on providing the most important features to the user through the simplest interface possible, and doing that means using new techniques.

PROBLEM STATEMENT

The single largest problem with existing ground station software is that it isn't as flexible as software developers try to make it. Most implementations use Java as their language of choice because it is considered a reliable cross-platform solution. While this might be true, Java is a very static language, just like most popular languages, such as C and C++. These languages are powerful and well-tested, but that alone does not qualify them as good choices for ground station software. While they are flexible languages in a sense that they can perform many diverse tasks, the paradigms and design patterns they dictate are not always desirable. Due to the fact that they are static languages, developers are forced to create complex systems to allow for the flexibility which they desire in their applications. For example, with the modular approach many projects use, software is organized into small components so that the updating, removing, or adding of a component has the smallest possible effect on the other components. This saves time by ensuring that system administrators do not have to re-compile the entire application, but rather only the new parts, which is a good thing. But in order for these components to plug into each other correctly, each piece must pass messages to the other pieces in the specified way. In a system of significant size, which categorizes most implementations, this quickly becomes very difficult. What all this boils down to is that this setup clearly has its flaws. Attempting to make a flexible piece of software requires flexible code and technology in the background; using static languages is in fact possible, as shown by existing projects, but such technology is certainly not desirable for this task.

GROUND STATION SOFTWARE DESIGN

Luckily, technology is always changing for the better, making things more efficient and user- and developer-friendly. One such technology which will improve the world of ground station software is *dynamic programming languages*. The definition of a dynamic programming language is not entirely clear, but in general the term refers to a group of high-level languages which performs at run-time operations which most languages perform at compile time, if they perform them at all. Dynamic languages are not necessarily a new thing; these or similarly designed languages have been around for decades. However, new technology has addressed issues such as efficiency which have in the past made them inferior to the more popularly used static languages. Dynamic languages come with benefits and features that static languages don't – they can extend objects and add new code at run-time, for example. These features aren't necessarily exclusive only to dynamic languages, but dynamic languages provide easy access to them while other languages would require unattractive hack-like coding if they are supported. Because of the extensibility possible in applications developed with dynamic languages, they are well-adapted for creating systems which deal with unknown or unpredictably changing components –a category of systems which includes ground stations.

THE DYNAMIC DESIGN

While choosing a new and innovative language for this project might not alone and at face value seem to lead to a new approach, a deeper consideration will show that it indeed does; for lack of a better term, this approach, which is somewhat dictated by the nature of a dynamic language, will be referred to as a d*ynamic design* or a d*ynamic approach*. It simply refers to the paradigm most closely and naturally linked with the methodology behind such dynamic languages. Additionally, in this paper the term "dynamic design" also refers to a modular design. It was earlier stated that a modular design is undesirable. This is because technologies used in other software cannot support it well. When the technology in the background changes to a dynamic

language, however, a modular design quickly becomes not only simple and easily implemented, but also natural.

DESIGN GUIDELINES

With the argument for a revolution in the form of dynamic programming languages comes the proposal for a new ground station software project. In keeping with the theme of dynamic software, a dynamic programming language and thus a dynamic design will be the best approach. For the scope of this project, two languages seem to be contestable – Ruby and Python. Both have well-developed resources and support as well as a tendency to speed up the development cycle. Both have fairly recently gained a majority of their current popularity, having lived in the shadow of other, more often used languages. These languages are not, however, to be considered too young or undeveloped. With the boom in projects utilizing Python and Ruby, resources have flourished as has the development of each language. With that in mind, these are the two best options for the development of new ground station software. Because one of the enumerated goals in the design of this project is object-orientation (at the code level), and due to the fact that Ruby's support for classes seems more elegant and to be a more central feature to the language, Ruby will be the language used. Both certainly have advantages and disadvantages, but these will not be weighed further here.

High Level Design

The following attempts to outline the guidelines for the design and implementation of the new dynamic ground station software. The vision of the ground station includes both manual and automated modes. The system will feature an easy-to-use interface to increase the simplicity and usability of the application and to aid in the scheduling of tasks. More details are described below:

Reusability across platforms- Reusability and flexibility go hand in hand. There are two essential questions that need resolution to meet this goal: How modifiable is the code, and to what extent is the code abstracted from the system hardware? Because of the possibly diverse nature of ground station implementations, the software must be as modifiable as possible to ensure its cross-platform success. One large step toward this is taken for the developer by Ruby – because the code is interpreted, the source is readily available and modifiable. This allows station administrators to modify necessary code to ensure compatibility with their particular implementation. Another requirement of the application is that it abstracts the application from the hardware. In separating the application-specific tasks from the hardware, the systems on which the code will run are greatly increased in number. Much of this is done simply through the use of a high-level language.

Multi-tiered architecture

In keeping with trends of modern internet applications, the application should follow somewhat closely a three-tiered architecture. The interface presented to the user (or the scheduler in the case of automated control) should interact with a server to retrieve information stored in the database. The top, most visible layer of the application should have no direct contact with the database and data storage level. This keeps communications standard and simple, and avoids confusing and random access to data. Also, because remote access is possible, it might be at some time necessary for a local server to access a remote database. This must also be done through the remote server, such that servers may communicate remotely, but only a local server may access a local database.

User-interface

In keeping with the theme of using advanced programming technology, the user interface will be very modern and simple to use also. Many GUI's are overly simplified, making their use more difficult than necessary. The GUI should be kept as simple to use as possible for the sake of the user, not as simple to create as possible for the sake of the developer. In the GUI, satellite and telemetry data will be easily viewed using various windows and controls. The changing of satellite parameters is also made possible by the GUI. If the satellite is not in range, the adjustments should be scheduled and made when the satellite is available. Therefore, schedule data should be presented and made manageable through means of the GUI. The ability to make a routine schedule to be executed at every pass is also crucial.

Scheduling- The ability to run the station in automated mode should be a key feature of any new ground station software, this one included. One key feature of some dynamic programming languages of which Ruby also takes advantage is *Reflection*. A program written in a language that is said to be

reflective is capable of producing or extending its own code. The GUI will interpret user events or accept textual input and in turn produce a valid script to be executed at a pre-determined time. This script could also simply be hand-coded if necessary, but the validity of such a script might be questionable. Essentially, the GUI should provide a sort of graphical coding option which allows the user to select available actions and commands from a list or by means of visual controls and widgets so as to avoid any errors in the scheduled process yet still allow for full control and maximize the use of all of a satellite's capabilities.

The above summarizes the most innovative and important aspects of the software being proposed. These are not all the innovations, but summarize the areas of development or use which are most greatly affected by the switching to a more dynamic design. What is expected of this project is that it will reach a wider audience than previous software. Previous designs have failed to be flexible. They are prematurely optimized for modification using tools not meant for the job, which detracts from what the focus of ground station software should be – providing the user with the correct tools to do what needs to be done in order to use and maintain a satellite in orbit.

Implementation

Now that the high-level design and goals have been revealed, the low-level details of the software must be clarified. The software will be coded in Ruby and utilize MySQL for database functions. The program will be modular in design. This will, as is typical, mean that modifying one piece of code affects a very small amount of other code. Where this design differs from others is that no re-compilation is necessary, since the code is interpreted. The source files must be available to run the program, so the source will also have one hundred percent accessibility, which aids in the ability to modify the code. In addition, because of language-specific features, items can even be modified at the object level without too much hassle. The new software will be best described as a loosely coupled system while being strongly modular. The software is loosely coupled because the modules can access only their own data and are aware of only data given to them from other modules. They cannot haphazardly access data from other modules. The modules may be called "strong" because each module has a very narrow andspecific function, as opposed to a weak module. This follows object-oriented principles also, such that each module will most nearly contain only one class. Each class or module has the goal of being specific and narrow. Here are some of the key modules and a brief description of each:

***GUI Front End Application* – This is the client which allows the user access to all of the ground station's software features. It is presented as a GUI application.**

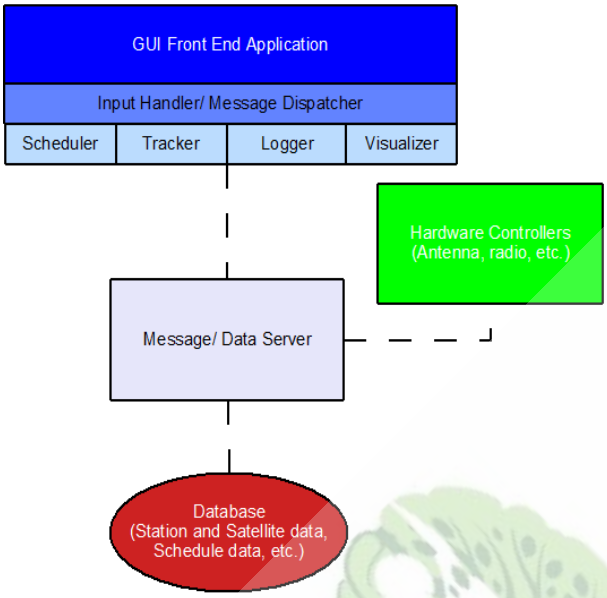
Input Handler – The input handler and message dispatcher handles all user input from the GUI application and dispatches it to the corresponding module. Modules are thus unaware of irrelevant input and only the necessary modules are sent messages.

Scheduler – The scheduler handles multiple tasks and is broken down into sub-modules. First, the scheduler executes schedules at a specified time. Second, the scheduler creates schedules through the use of the GUI application and stores them in the database.

Tracker – The tracker is responsible for predicting passes and communication time for the satellite with which the user is communicating.

Logger – The logger logs all station activity for future reference and review.

Visualizer – The visualizer is the part of the ground station software which displays satellite data through various controls and widgets.



Of course, the above diagram is very simplified. These components are those most exposed to the user, though sometimes the user does not realize it. Other components exist and will be used behind the scenes as inherited classes, for example. One instance of this is the messaging system. Each component needs to be able to send and process messages, so it is logical for each module to contain an instance of the message system class. This is not shown on the diagram because it is in a level below the components mentioned.

As mentioned, each of the components of the ground station in the diagram communicates with the others through a standard messaging interface. These messages are sent from the originating module to the message server, which then dispatches them to the appropriate destination module. In this way, the code is easily modified to fit the needs of an individual station. The developer for the station which needs modification has multiple options: 1) Modify the existing modules, 2) modify the message sending functions to redirect messages to a custom module, or 3) create entirely new modules which send messages appropriately and are therefore integrated into the existing structure seamlessly and with little effort. Because of the interpreted nature of the source, developing, testing, and debugging are incredibly quick and simple. The developer can modify multiple modules in seconds, without recompiling or any other overhead.

CONCLUSION

A quick search of scholarly resources will prove that many different projects, especially at the university level, work toward the result of creating ground station software. These projects are nearly all the same, so none of them has succeeded. There is hardly a mention in any of these projects of other software, proving that there is no consideration of what has been done and has been proven to not work. With an extensible application like the one detailed in this paper, future projects can focus on extending the capabilities of ground stations instead of rewriting the same software with a different name. Additionally, new functionality which they might desire will be easily added to software as dynamic as the one described above.

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INTERNET BANKING CUSTOMER SATISFACTION: AN Empirical STUDY IN DELHI AND NCR

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ABSTRACT

Internet banking is a delivery channel for banks in India. The i-banking channel is both transactional and informative. While looking at the impact of Internet banking in industries it has been noticed that it has helped to remove the constraint of time, distance and communication thus, making world a global village. The study was conducted with an objective to study the overall satisfaction of the consumers with the quality of services. Also, to know the perception of customers on all the dimensions of service quality and to know whether the dimensions service quality are significantly associated with each other. A structured questionnaire was drafted to collect data regarding the customer opinion on Internet Banking Provider. The sample size of 100 was taken from Delhi and NCR. The data contains the personal details, demographic details and perception of Customers on all dimensions of service quality. To achieve the objective reliability test, T-Test, Correlation, Servqual was conducted. This study brought out clearly that the expectations of the customers on the service quality items are higher than the bank's actual performance.

KEYWORDS

Quality of Services	Satisfaction
Perception of consumers	Internet Banking

INTRODUCTION

Over the past few years, the online service industry has grown tremendously mainly with the Internet Revolution. Especially, the incoming of web as a commercial medium is widely accepted by everyone, also the growth in online service industry like, Internet banking is on a rapid growth. Along with many Internet Companies, many traditional companies are also making investments and putting a lot of effort to give away their services online. The main reason for their investment is that Internet Banking allows customers to make financial transactions on a secure website operated by their retail or virtual bank. Which enables the customers to have a convenient, customized, interactive, low cost and fast banking transactions on the Internet, that will enhance customer satisfaction and retention as compared to offline services.

In Internet Banking customers can do banking from anywhere, anytime which can be used for transactions, payments, etc. So, basically, in internet banking a client has one-to-one interaction with the bank's website, and in this situation it becomes essential on the part of bank to provide high quality services over the internet. Therefore, i-banking involves non-human interactions between internet banking information system and its customers. It also enables customers to do banking from office, home or virtually anywhere else in the world, and requires only an internet access, along with a web browser and a registered account for internet banking of a banking institution Here all the services that the bank has permitted on the internet are on the menu. Where, the service which is required can be easily used. Internet banking, thus, now is more of a norm rather than an exception in many developed countries due to the fact that it is the cheapest way of providing banking services (Arunachalam and Sivasubramanian, 2007).

While looking at the impact of Internet banking in industries it has been noticed that it has helped to remove the constraint of time, distance and communication thus, making world a global village. On the other hand, Factors such as competitors cost, customer service, increase in awareness and education level, also, the income of customers, influence banks to constantly look into their technology and assess their internet banking service quality. Many studies have tried to provide with a set definition of service marketing and develop instruments in order to measure it. Parasuraman et al. (1988) introduced a service quality instrument, called SERVQUAL, which has been used in various studies for different areas. Service quality is mainly studies so as to get a competitive edge over others. Thus, Parasuraman developed this instrument to measure customer's perception and expectations from service.

Internet banking is a delivery channel for banks in India. The i-banking channel is both transactional and informative. Even though, i-banking is popularly adopted in India as expected. Malhotra and Singh (2007) studies the i-banking adoption by the banks in India. According to the study, the larger banks or banks which have just established themselves, private ownership banks possess high probability of adoption of this new technology. Also, the Banks with low market share perceive i-banking technology as a means to increase the market share by attracting more and more customers through this new channel of delivery.

REVIEW OF LITERATURE

Internet banking is being widely adopted in India. There are three functional level/kinds of internet banking that are currently employed in the market place and these are: Informational, Communicative and Transactional. Informational (Websites) - This has been identified as the first level of internet banking. Communicative/Simple transactional (Websites) – This type of internet banking allows some interaction between the bank's systems and the customer. Advanced Transactional (Websites) - This level of internet banking allows bank customers to electronically transfer funds to/from their accounts, pay bills and conduct other banking transaction online (Thulani et al ,2009; Yibin,2003 and Diniz ,1998.

The major banks in India are increasingly providing services through electronic channels such as ATMs, internet banking, tele-banking and mobile banking. Thus, they attempt to examine the various usage patterns by customers of these technology enabled services provided (A J Joshua, Moli P Koshy , 2011). There are three identified dimensions of Service quality: core services, additional services, and problem-solving services, these dimensions determine the customer's evaluation of service quality (Hernan E. Riquelme, Prof. Riquelme & Mr Mekkaoui ,2009). On the other hand, In the study by

Ibrahim et al, six composite dimensions of electronic service quality were revealed, including the provision of convenient/accurate electronic banking operations; the accessibility and reliability of service provision; good queue management; service personalization; the provision of friendly and responsive customer service; and the provision of targeted customer service (Ibrahim et al ,2006). According to another study conducted by Amin, perceived usefulness, perceived ease of use, perceived credibility and computer self-efficacy are the factors affecting the adoption of internet banking (Amin 2007). Thus, the elements with the most immediate impact on service evaluation are cues in the service setting, key events in the service encounters and the level and nature of customer participation (Broderick and Vachirapornpuk ,2002).

There are many researchers who have worked on customer satisfaction. Dr. Badiyani J.M. examined the satisfaction level of internet banking users based on various attributes in Gujarat state. He also evaluated the variation in satisfaction level on the basis of demographics (Dr. Badiyani J.M., 2010). Whereas, according to Howard and Sheth consumer satisfaction is a psychological state of the consumers, to appraise the reasonableness between what a consumer actually gets and gives (Howard and Sheth, 1969). On the other hand along with studying the customer satisfaction with internet banking, the positive influence of internet banking on the environment was also studied. Internet banking is seen as the bank's innovative product as it helps in saving paper, energy and other resources resources and as result to decrease carbon footprint and to provide other business with possibility for sustainable development (Hermanis Rullis, Biruta Sloka , 2011).

Various tools have been adopted so as to measure service quality. Broderick and Vachirapornpuk (2002) and Jun and Cai (2001) had employed qualitative techniques. They have focused on specific service delivery aspects of conventional, simple banking web sites. Jun and Cai , identify 532 critical incidents in online banking, By using the critical incident technique, They are grouped into three central quality categories namely that of customer service quality, online systems quality, and banking service products quality. Whereas, Kano's (1984) gives out a method for measuring customer-defined quality and there after suggests three fundamental quality demands relevant to quality evaluation: basic demands, performance demands and enthusiasm demands .Whereas, These demands can be henceforth, fulfilled by three types of performance elements. According to Kano, Basic performances are regarded as obligatory (must-be services) and are therefore, not explicitly voiced, i.e. it is the most basic thing that needs to be given out. Whereas, Spoken attributes are typically voiced, while on the other hand, surprise attributes are again rarely voiced (as they are unexpected) and can therefore, achieve high levels of satisfaction in sense of excitement Kano's (1984).

There have been many advantages of Internet Banking, According to Delvin (1995), customers have less time to spend on activities such as visiting a bank and therefore want a higher degree of convenience and accessibility (Delvin ,1995). The service-quality attributes that the Internet banks must offer to induce consumers to switch to online transactions and keep using them are perceived usefulness, ease of use, reliability, responsiveness, security, and continuous improvement (Liao and Cheung, 2008). Whereas, Research on consumer attitude and adoption of internet banking showed there are several factors predetermining the consumer's attitude towards online banking such as person's demography, motivation and behavior towards different banking technologies and individual acceptance of new technology. It has been found that consumer's attitudes toward online banking are influenced by the prior experience of computer and new technology (Laforet and Li, 2005).

Looking at the negative side of it, The adoption of electronic banking forces consumers to consider concerns about password integrity, privacy, data encryption, hacking, and the protection of personal information. Electronic banking requires perhaps the most consumer involvement, as it requires the consumer to maintain and regularly interact with additional technology (a computer and an Internet connection). Consumers who use e-banking use it on an ongoing basis and need to acquire a certain comfort level with the technology to keep using it (Benamati and Serva,2007).

In another study by Liao and Cheung, 2002, they found that individual expectations regarding accuracy, security, network speed, user-friendliness, and user involvement and convenience were the most important quality attributes in the perceived usefulness of Internet-based e-retail banking. Mavri and Ioannou, (2006), The crucial factors that affect an individual's decision to use or not to use online

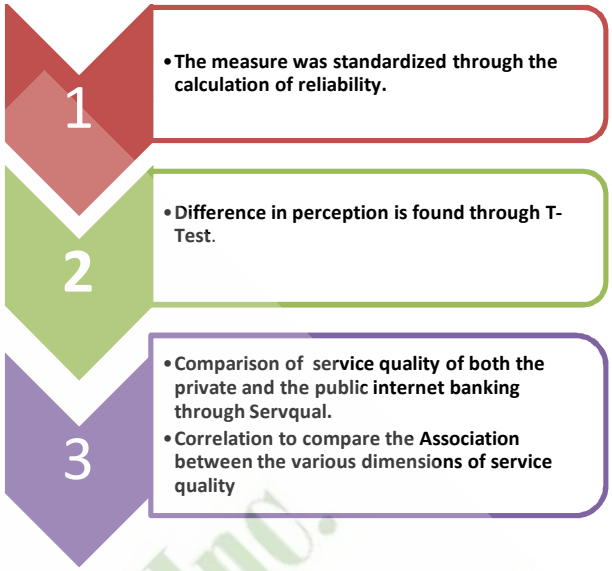
services the individual's age, the difficulties of using the Internet, the fear of changes in the banking sector due to technological development and the lack of information concerning products and services provided to customers through electronic delivery channels. Factors such as the speed of transactions or the cost of using the Internet have little impact on an individual's final decision.

RESEARCH OBJECTIVES

To measure the overall satisfaction of the consumers with the quality of services.
To study if the perception of customers on all the dimensions of service quality differ across private bank and Public Bank internet Banking users .
To study if the dimensions of service quality are significantly associated with each other.

RESEARCH METHODOLOGY

Primary data has been collected for the purpose of this research. In order to collect data, Structured questionnaire was framed. Whereas, to avoid any misinterpretation, the pretesting of questionnaie was conducted on a pilot group that were selected from the population. For Pilot study, a survey of 20 respondents was conducted. After Pretesting Necessary modifications were made to the questionnaire. A five point likert scale was adopted (1= Strongly Disagree and 5= Strongy Agree). The study was conducted only in Delhi and NCR region with the sample size of 100 respondents, An individual respondent was the sampling element. Simple random sampling is conducted in order to collect the data. Following are the research tools and techniques used for analysis



SERVQUAL - Parasuraman et al. (1988,1991) identified more detailed dimensions of service Quality and thus, developed the model of SERVQUAL, in order to measure the perception of the customers and also their expectation from the service. This model consists of five main dimensions, which further have two sets of 22 item statements for the 'expectation' and 'perception' sections of the questionnaire. The responses of the customers are recorded on the five point likert type scale (1 = Strongly Disagree and 5 = Strongly Agree). Similarly, the questions related to demographic profiles of the respondents such as gender, income, education and age are also included. In order to get the perceived Quality the customer perception is subtracted from the customer expectation scores.

DATA ANALYSIS

TABLE 4.1 Demographic Characteristics of the Respondents

DEMOGRAPHIC PROFILE		PUBLIC BANK		PRIVATE BANK	
	Categories	**Count**	**Percentage (%)**	**Count**	**Percentage (%)**
Gender	Male Female	32 18	64 36	35 15	70 30
Age	18 to 21 years 22 to 25 years 26 to 31 years 32 to 56 years	12 10 14 14	24 20 28 28	10 10 16 14	20 20 32 28
Bank	SBI Bank of India Bank of Baroda Allahabad Bank Uco Bank PNB Bank of Maharashtra	10 7 8 6 7 7 5	20 14 16 12 14 14 10	ICICI – 11 HDFC - 8 AXIS- 7 Standard Chartered-10 Barclays- 7 HSBC - 7	22 16 14 20 14 14
Education	Degree Post-Graduation Professional Degree Others	9 23 12 6	18 46 24 12	10 20 14 6	20 40 28 12
Profession	Salaried Professional Student Housewife Business Retired	11 9 10 6 10 4	22 18 20 12 20 8	10 14 5 4 14 3	20 28 10 8 28 6

This section deals with the findings related to classification of respondents on the basis of Gender, Age, Type of Bank, Education Level and the Profession. The Demographics are further divided on the basis of Private Sector Bank and Public Sector Bank Internet Banking Users. The data that is represented shows that the sample is male dominated as male respondents are 64% and 70% respectively for Public Bank and Private Bank of the total sample size, see (Table 1). The respondent's age analysis shows that the sample is equally divided across the age groups, thus getting a fair view across all age groups. Looking at the Internet Banking Provider used by the respondents it is found that all the respondents were fairly divided across all the Public and Private Sector Banks. Majority of the respondents were Post- Graduates i.e. 46% and 40% respectively for Public Bank and Private Bank. The sample consisted mainly the salaried, professionals and the business men/ women.

TABLE 4.2 Group Statistics

	Bank	N	Mean	Std. Deviation	Std. Error Mean
Tangibility	Private	50	4.2800	.66171	.09358
	Public	50	3.9200	1.04545	.14785
Reliability	Private	50	3.6120	.99173	.14025
	Public	50	3.4280	1.06752	.15097
Responsiveness	Private	50	3.2750	1.08709	.15374
	Public	50	3.2000	1.09031	.15419
Assurance	Private	50	3.5300	.84913	.12009
	Public	50	4.2100	.51597	.07297
Empathy	Private	50	3.2880	.74741	.10570
	Public	50	2.9320	.85486	.12090

The Majority of the Private Bank internet Banking users perceive, bank's tangibility to be above average, whereas its Empathy which has lowest mean to be just at the margin. In case, of Responsiveness both the banks' internet banking service scored equal, hence, they are perceived to be same in terms of Responsiveness. Moving on to Public Bank Internet Banking users, they believe Assurance is the strength of Public Banks. Whereas, on the other hand, Public bank was ranked the lowest on the basis of Empathy. See Table 4.2)

TABLE 4.3 Reliability Statistics

RELIABILITY TEST	Cronbach's Alpha	N of Items
PUBLIC BANK*	.898	22
PRIVATE BANK*	.974	22

*internet banking users

Model is usually considered Reliable if the items used within give similar outputs or results, regardless of who administers it and in which form. Alpha Value is measured between 0 to 1. If the Alpha value is above 0.5 then it is considered a good scale. Closer the Alpha to 1, greater will be the internal consistency of the items in the model being assessed.

In order to accurately capture the customer's response reliability analysis is carried out. See (Table 4.3) the Cronbach's Alpha value is .898 for Public Bank and .974 for Private Bank which is greater than 0.5 thus we can safely conclude that the sample size and the data collected are reliable and also the reliability is shown to be good using all 22 items.

TABLE 4.4 Servqual

PRIVATE BANK	perceived mean	expectation mean	SERVQUAL Scores (Average)	Weights	Weighted Servqual
Tangibility	4.28	4.89	-.61	18.86	-.1150
Reliability	3.61	4.88	-1.27	21.12	-.2682
Responsiveness	3.53	4.90	-1.37	20.45	-.2802
Assurance	3.53	4.70	-1.17	21.35	-.2498
Empathy	3.29	4.76	-1.47	18.22	-.2682

Total Weighted servqual Score = -.2362

	PRIVATE BANK	tangibility	Reliability	Responsiveness	Assurance	Empathy
tangibility	Pearson Correlation	1	.457(**)	.352(*)	.486(**)	.300(*)
Reliability	Pearson Correlation	.457(**)	1	.939(**)	.838(**)	.799(**)
Responsiveness	Pearson Correlation	.352(*)	.939(**)	1	.831(**)	.859(**)
Assurance	Pearson Correlation	.486(**)	.838(**)	.831(**)	1	.784(**)
Empathy	Pearson Correlation	.300(*)	.799(**)	.859(**)	.784(**)	1

From the Servqual Scores (See TABLE 4.4), give the overall service quality of Private Bank's*, based on the difference between expectation and performance perceptions of the customers, using 22 items, which are divided into 5 dimensions as seen in the table above.

The SERVQUAL Scores for the five Dimensions having weights as given by the respondents on the basis of their preference are given in the above table. These Dimensions include Tangibles, Reliability, responsiveness, assurance and empathy. One can see that empathy has the highest negative SERVQUAL Scores. In other words, Empathic Behaviour's satisfaction level is the lowest in Private Banks* as compared to other factors.

While looking at the weightage given by respondents to the dimensions, Assurance and Reliability are rated the highest (21.12% and 21.35% respectively). Empathy having the highest negative score has become now, less important dimension. Since, it is given least weightage i.e. 18.22% by the respondents. Thus, highest Negative Weighted Servqual Score moved from Empathy to Responsiveness. Also, the Total Weighted Servqual Score being -.2363.

*Private Banks Internet Banking Service

TABLE 4.5 Servqual

PUBLIC BANK	Perceived Mean	Excepted Mean	Servqual Scores (Average)	Weights	Weighted SERVQUAL
Tangibility	3.92	4.67	-.75	16.76	-.1257
Reliability	3.42	5.00	-1.58	25.32	-.4001
Responsiveness	3.20	4.80	-1.60	19.45	-.3112
Assurance	4.21	5.00	-.79	24.35	-.1924
Empathy	2.93	4.57	-1.64	14.06	-.2306

Total Weighted servqual Score= -.2519

Here from the (Table 4.5), One can see that empathy has the highest negative SERVQUAL Scores. In other words, Empathic Behavior's satisfaction level is the lowest in Public Banks* which is closely followed by Responsiveness and Reliability respectively.

While looking at the weightage given by respondents to the dimensions, Reliability and Assurance are rated the highest (25.32% and 24.35% respectively). Empathy having the highest negative score, has become now, less important dimension. Since, it is given least weightage i.e. 14.06% by the respondents. Thus, highest Negative Weighted Servqual Score moved from Empathy to Reliability. Also, the Total Weighted Servqual Score being -.2519.

*Public Banks Internet Banking Service

TABLE 4.6 Correlation between five dimensions

Correlations	tangibility	Reliability	Responsiveness	Assurance	Empathy
Tangibility	1	.383(**)	.325(*)	.310(*)	.159
Reliability	.383(**)	1	.939(**)	.523(**)	.440(**)
Responsiveness	.325(*)	.939(**)	1	.501(**)	.479(**)
Assurance	.310(*)	.523(**)	.501(**)	1	.186
Empathy	.159	.440(**)	.479(**)	.186	1

In the case of Public Bank*, The values in the correlation table are standardized and they range from 0 to 1 (+ve or –ve). All the five dimensions are positively correlated. Reliability and Responsiveness being highly Correlated (.939), thus, if Public Banks'* Reliability needs to be improved then Responsiveness should also be taken into consideration and improved.

Other Dimensions that are highly correlated are Reliability and Assurance, followed by Responsiveness and Assurance. One can also conclude that all the dimensions have positive correlation with each other thus; improving upon one will get a positive impact on the other.

Similarly, in the case of Private Bank*, all the five dimensions are positively correlated

TABLE 4.7 Correlation between five dimensions

The Hypothesis formed will be as follows:

H0: There is no difference in tangibility as given by Private Bank and Public Bank Internet Banking users.

H1: There is difference in tangibility as given by Private Bank and Public Bank Internet Banking users.

H01: There is no difference in Reliability as given by Private Bank and Public Bank Internet Banking users.

H1: There is difference in Reliability as given by Private Bank and Public Bank Internet Banking users.

H01: There is no difference in Responsiveness as given by Private Bank and Public Bank Internet Banking users.

H1: There is difference in Responsiveness as given by Private Bank and Public Bank Internet Banking users.

H01: There is no difference in Assurance as given by Private Bank and Public Bank Internet Banking users.

H1: There is difference in Assurance as given by Private Bank and Public Bank Internet Banking users.

H01: There is no difference in Empathy as given by Private Bank and Public Bank Internet Banking users.

H1: There is difference in Empathy as given by Private Bank and Public Bank Internet Banking user

TABLE 4.8 Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
tangibility	Equal variances assumed	8.373	.005	2.057	98	.042	.36000	.17498	.01277	.70723
	Equal variances not assumed			2.057	82.831	.043	.36000	.17498	.01197	.70803
Reliability	Equal variances assumed	.911	.342	.893	98	.374	.18400	.20606	-.22493	.59293
	Equal variances not assumed			.893	97.473	.374	.18400	.20606	-.22496	.59296
Responsiveness	Equal variances assumed	.144	.705	.344	98	.731	.07500	.21774	-.35710	.50710
	Equal variances not assumed			.344	97.999	.731	.07500	.21774	-.35710	.50710
Assurance	Equal variances assumed	13.320	.000	-4.839	98	.000	-.68000	.14052	-.95885	-.40115
	Equal variances not assumed			-4.839	80.844	.000	-.68000	.14052	-.95959	-.40041
Empathy	Equal variances assumed	1.302	.257	2.217	98	.029	.35600	.16059	.03732	.67468
	Equal variances not assumed			2.217	96.284	.029	.35600	.16059	.03725	.67475

We do T-Test to know whether the if the two sets of Internet banking users of Public Bank and Private Bank, have Similar perception of the Five dimensions of service Quality or not. The five dimensions are Tangibility, Reliability, Responsiveness, Assurance and Empathy. Thus, now we do a statistical test to find out if the two sets of ratings are significantly different from each other

or not. The significance level is 0.05 i.e. with 95% confidence level we are testing our hypothesis.

If the 'p' value is less than the significance level set up by us for the test, we reject the null hypothesis. Otherwise, we accept the null hypothesis. In this case, we find the 'p' value for't' in the first hypothesis is .042, which is less than 0.05 thus, we reject the null hypothesis, hence, we find a significant difference in tangibility as given by Private Bank and Public Bank Internet Banking users.

In the second case, since the 'p' value for Reliability and Responsiveness is .374 and .731 respectively which is greater than the significance level, thus, we can conclude that we fail to reject the null hypothesis and there is no significant difference in Reliability and Responsiveness as given by Private Bank and Public Bank Internet Banking users.

Moving on to Assurance and Empathy, the 'p' value in their case is .000 and .029, which is less than the significance value (.05). Thus we reject the null hypothesis and conclude that there is significant difference in assurance and empathy as given by Private Bank and Public Bank Internet Banking users.

FINDINGS

Service Quality being the functional issue of commercial banks. There are various methods of measuring the customer Satisfaction and needs; The Servqual is considered as the most suited method for measurement of the commercial banks quality of service. In this Study service quality of Public and Private Sector internet banking was measured using Servqual.

Majority of respondents are having good educational qualification to respond to the questionnaire as indicated by the demographic features of the population. Besides, the proportion of respondents in Salaried, professional and business class is significant.

The main findings of the study were the expectation of the customers on the service quality items was higher than the bank's performance. The largest negative score of Servqual was of Reliability in case of Public Bank* and Responsiveness in the case of Private Bank*. In other words the gap between the perceived quality and Expected quality when multiplied with the weights is the lowest in case of reliability and responsiveness. Also, the perceived quality is less than satisfactory in this case indicated by weighted service quality score and thus needs immediate attention. It is an indication of customer's dissatisfaction and can be considered as an opportunity to the other competitors for meeting customer expectations in a better manner.

Finally through correlation, high positive correlation was found between the all five dimensions of service quality both in the case of private sector* and Public Sector*. Also, in the case of Independent sample T-Test, significant difference was found in tangibility, assurance and empathy as given by Private Bank and Public Bank Internet Banking users.

It was observed that there is a need to change the behavior of the administrators (call center personnel's and help desk) which is indeed very hard to solve but it is important. It can be possible if there be some training sessions to enlighten them with the customer service values, also the service providers should make their system more efficient and thus, provide services as promised and on time, banks can also increase the working hours so as to give personal attention to the customers. Overall, the study tried to point out the gap which exists in the service quality; however, it can improve with a slight change in the orientation of the bank's policy.

*internet banking users

CONCLUSION

In today's competitive scenario, it becomes difficult to get an edge over the other internet banking providers. Only the customer perception and satisfaction can play a differentiating role for the banks. Therefore, amongst this highly competitive environment, success of the service providers depends only on the degree to which the company's policies are customer oriented. Therefore, the firms fail to provide with customer needs and expectations tend to extinct in the long run.

MANAGERIAL IMPLICATIONS

It was observed that there is a need to change the behavior of the administrators (call center personnel's and help desk) which is indeed very hard to solve but it is important. It can be possible if there be some training sessions to enlighten them with the customer service values, also the service providers should make their system more efficient and thus, provide services as promised and on time, banks can also increase the working hours so as to give personal attention to the customers. Overall, the study tried to point out the gap which exists in the service quality; however, it can improve with a slight change in the orientation of the bank's policy.

Customers are more demanding, value oriented and educated. Thus, the internet banking service providers should work on building high level of trust in order to maintain loyalty levels and quality relationships with them. They must be sincere and honest in keeping up with all the promises they make and also, provide service on time as promised. Also, the main focus should be security and timely transactions which will keep the customers loyal to the service provider.

Since, customers are more quality conscious and price sensitive, the actions of the service provider will lead to increased trust and loyalty in the internet banking of the bank. Thus, customer service should be given utmost importance along with commitment to the customers, since customers are provided will numerous options from the competitors.

It is also noticed that loyal customers can add more customers by positive word of mouth and references about the efficient service of the company. Lastly, by providing effective service to the customers, through quality service, commitment and effective communication, service providers can better understand the needs of the customers and serve these needs more remarkably as compared to the competitors and thus, eliminating higher switching cost.

LIMITATIONS

The study was conducted amidst certain limitations. Which can be seen as follows: firstly, the impact of impact of socio-demographic factors such as gender, educational level, income and age should be taken into consideration so as to look into service quality and customer loyalty relationship, which can help in effectively contributing towards managerial implications.

Secondly, due to the limitation of financial resources and time available, survey of customers is of limited scale and scope, such that it might not be a complete representation of the population.

Thirdly, the study only covers Delhi and NCR region, such that the results may not apply directly to all other regions.

Lastly, a small sample size has a greater probability that the observation just happened to be particularly good or particularly bad. Therefore it is harder to find significant relationships from the data, as statistical tests normally require a larger sample size to justify that the effect did not just happened by chance alone.

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ABSTRACT

Website monitoring is the process of testing and verifying that end-users can interact with a website or web application .Website monitoring is often used by business to ensure that their sites are live and responding.

Website Monitoring: *Contemporary way to test and verify*

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KEYWORDS

Web Monitoring	Verify
Test	URL

INTRODUCTION

Website monitoring is the process of testing and verifying that end-users can interact with a website or web application .Website monitoring is often used by business to ensure that their sites are live and responding.

The most important online face of your organization is your website. So what damage is caused to your brand and sales when your website is unavailable? It may be that your customers cannot perform online transactions and go to your competitors instead. Or it could be that client email is not received and your helpdesk gets inundated with calls.

Website security monitoring is also used to verify that the domain (and web site) is not only responding properly, but has not been hacked, blacklisted or hijacked. Multiple tools are available to automate site availability checks and security checks.

As a website owner or webmaster, it is your goal to find ways to attract visitors to your site as well as to get them stay longer to use your site services. However, if your website performs poorly and you are not even aware of it, it will be really hard to realize these goals. This is where an efficient web site performance monitoring solution can help.

Various companies like site 24x7 provides the functionality of continually monitors web site's performance on a 24x7 basis and alerts you whenever these is any degradation of performance. A key indicator of the performance of any web site is its response time. When a web site is slow or unresponsive, it may drive users away from the site.

According to Gartner 50 % of visitors will abandon a page if it takes more than 15 seconds to load. Therefore, Website owner should never compromise with slow loading Web Pages.

Site 24x7's website performing feature checks for various attributes such as response time, etc. For example, you can add a URL, say//mycompany/estore.jsp, for monitoring. You can set up a threshold for the webpage such that if the page load time of that page is more than 5 seconds, you should be notified through e-mail/SMS/RSS. This helps you in taking quick action before it affects end users.

A perfect monitoring provides daily/weekly performance reports through email to know your site's performance on a daily/weekly basis. Website owner can also view time –based response time reports form 'Reports' tab that give them a fair idea of the performance of their websites over a period of time. If they noticed a constant degradation of performance, then they can take necessary actions to improve it.

The website performance monitors tests your web site URLs as often as every minute from multiple cities around the globe, and generates real-time alerts if page errors or performance problems occur. Also provide detailed reporting and extensive global monitoring to ensure than your site consistently performs at the preferred levels.

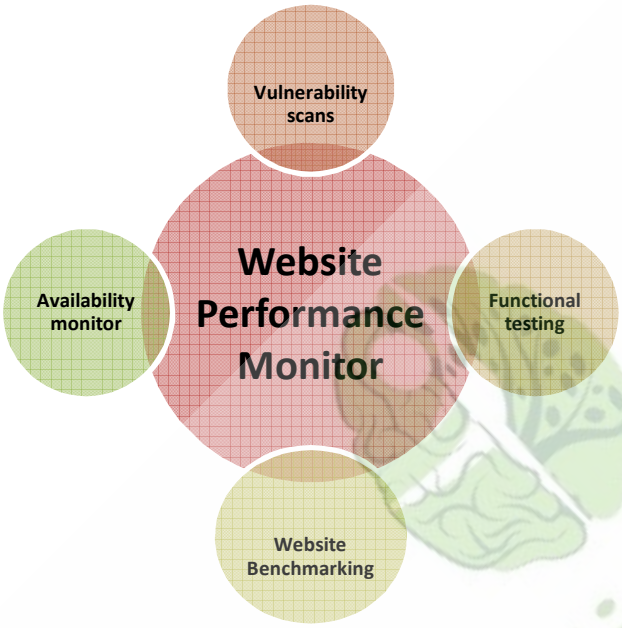
Website monitoring has become a full-fledged industry, giving website owners a myriad of choices from monitoring software, to subscription services to live monitoring. There are "inside jobs" and there are global agents. There are do-it-yourself systems and there are experts waiting to serve you. There are web hosting companies that monitor for their clients and there are free agents. What king of website performance monitoring service do you want? It depends on your requirements:

The website performance Monitor captures all performance details for every webpage object, including images, flash, java script, css and more.

RESPONSE TIME HISTORY

If your business is online, monitoring the performance of your website is must then there is a solution that can help.

The solution is called 'website performance monitor' and includes a choice of the following safety checks on your website:



AVAILABILITY MONITORING

It is estimated that downtime coasts European businesses 5 billion a year. While every minute of downtime can cost your business in lost revenue, it can also severely damage your brand reputation and bring your business to a halt. With a globally distributed infrastructure of more than 35 monitoring stations, various web hosting companies provides availability monitor continuously checks your websites, servers and applications, to deliver verification that your website is available and functioning properly. Availability monitor conducts checks from an external perspective, to replicate real user's experiences and provide your business with independent information about your website's performance and availability.

VULNERABILITY SCANS

With a dramatic rise in malicious attacks it has become critical to scan your websites and servers for security vulnerability. Having the latest firewalls and intrusion detection systems will not protect your organization if they are not kept up-to-date and configured correctly. Vulnerability scan is an affordable way to routinely check company's security risk and provide you with peace-of-mind that software applications cannot be hacked into from those outside of your organization.

WEBSITE BENCHMARKING

As the internet has become the preferred channel through which many customers obtain information, products and services, can your business afford not to know how your website compares to your competitors? Website Benchmarking measures the performance of your websites from locations across the globe, to provide accurate load time, speed and availability statistics. These measurements are used to create site performance index (SPI), which represents the users' perceptions of your website. SPI is then ranked, relative to that of your sector and competitors within countries relevant to your business. A website benchmarking report gives you an overview of trends in relative performance and availability across sectors and countries.

FUNCTIONAL TESTING

Functional testing checks the behavior of your site and identifies where exactly bottle necks or problems occur. It also ensures you know how your customers experience your site when they interact with it from different locations. Functional testing monitoring scripts can be written to identify a wide variety of possible issues, from slow page response times, to monitoring the behavior of forms such as login pages and issues with shopping baskets.

PRODUCT OPTIONS

Website Performance Monitor is available from various web hosting companies in different cost effective options, allowing you to pick the option that is right for your business.

Receive reliable website monitoring over 25 globally disturbed monitoring stations	Receive independent comprehensive verification of your website's performance	A web based portal for easy viewing of monitors, rules and reports	Respond quickly to website problems, resolving issues before your customers encounter them	Verify internal departments and external suppliers (ISPs/hosting) are meeting their SLAs

WHAT IMPACT ?

If it's up…	A.K.A…	It's down… per year
90%	n/a	876 hours
95%	n/a	438 hours
99%	Two 9's	87 hours, 36 minutes
99.9%	Three 9's	8 hours,45 minutes, 36 seconds
99.99%	Four 9's	52 minutes, 33.6 seconds
99.999%	Five 9's	5 minutes, 15.36 seconds
99.9999%	Six 9's	31.68 seconds

TYPES OF WEBSITE PERFORMANCE MONITORING

There are 2 main types of website monitoring:

1. **Synthetic monitoring** also known as **Active monitoring,** and
2. **Passive monitoring** also known as **Real monitoring.**

➢ Synthetic Monitoring

Synthetic monitoring (also known as Active monitoring) is **website monitoring** that is done using a **web browser** emulation or **scripted red web browsers.** Behavioral scripts (or paths) are created to stimulate an action or path that a customer or end user would take on a site. Those paths are then continuously monitored at specified intervals for **availability** and **response time** measures.

Synthetic monitoring is valuable because it enables a **webmaster** to identify problems and determine if his **website** or **web application** is slow or experiencing **downtime** before that problem affects actual **end users** or customers. This type of monitoring does not require actual web traffic so it enables companies to test web applications 24x7, or test new applications prior to a live customer facing launch.

Because synthetic monitoring is a simulation of typical user behavior navigation through a website, it is often best used to monitor commonly trafficked paths and critical business processes. Synthetic test must be scripted in advance, so it is not feasible to measure performance to every permutation of a navigational path and an end user might take. This is more suited for **passive monitoring.** Synthetic testing is useful for measuring availability and response time for critical pages and transaction (how a site performs from all geographies) but doesn't monitor or capture actual end user interactions.

Passive monitoring is also known as **real user monitoring** and can be used to monitor actual user sessions on web sites to detect and capture errors and performance slowdown. Passive monitoring products are usually based on hardware devices that sit **inside the firewall** and capture traffics as it enters.

TYPES OF PROTOCOL USED FOR WEBSITE MONITORING

Website monitoring services can check HTTP pages

- HTTPS
- FTP
- SMTP
- POP3
- IMAP
- DNS
- SSH
- Telnet
- SSL
- TCP
- PING

- Domain Name Expiry
- SSL Certificate Expiry

And a range of other ports with great variety of check intervals from every 4 hours to everyone minute. Typically, most website monitoring services test services test your server anywhere between once per hour to once per minute.

Advanced services offer in browser web transaction monitoring based on browser addons such as Selenium or iMacros. These services test a website controlling a large number of web browsers, thus they can also detect websites issues such as Javascripts bugs that are browser specific.

✓ **Web Service-SOAP Monitoring**

SOAP is a lightweight protocol for the exchange of information in a decentralized, distributed environment. It is an XML based protocol that consists of three parts: an envelope that defines a framework for describing what is in a message and how to process it, a set of encoding rules for expressing instances of application defined data types, and a convention for representing remote procedure calls and responses. The agents can replicate one or more end-client requests and monitor Web Services for availability and proper content.

50 MAJOR WEBSITE PERFORMANCE MONITORING TOOLS

1. **Allmon**

Description: The main goal of the project is to create a distributed generic system collecting and storing various runtime metrics collections used for continuous system performance, health, quality and availability monitoring purposes. Allmon agents are designed to harvest a range of metrics values coming from many areas of monitored infrastructure (application instrumentation, JMX, HTTP health checks, SNMP). Collected data are base for quantitative and qualitative performance and availability analysis. Allmon collaborates with other analytical tools for OLAP analysis and Data Mining processing.

Requirement: Platform independent

Download data: No data feed available

2. **Apache JMeter**

Description: Apache JMeter is a 100% pure Java desktop application designed to load test functional behavior and measure performance. It was originally designed for testing Web Applications but has since expanded to other test functions. Apache JMeter may be used to test performance both on static and dynamic resources (files, Servlets, Perl scripts, Java Objects, Data Bases and Queries, FTP Servers and more). It can be used to simulate a heavy load on a server, network or object to test its strength or analyze overall performance under different load types. You can use it to make a graphical analysis of performance or to test your server/script/object behavior under heavy concurrent load.

Requirement: Solaris, Linux, Windows (98, NT, 2000). JDK 1.4(or higher).

Download data: No data feed available.

3. **Benerator**

Description: Benerator is a framework for creating realistic and valid high-volume test data, used for (unit/integration/load) testing and showcase setup. Metadata constraints are imported from systems and/or configuration files. Data can be imported from and exported to files and systems, anonymized or

generated from scratch. Domain packages provide reusable generators for creating domain-specific data as names and addresses internationalizable in language and region. It is strongly customizable with plug-in and configuration options.

Requirement: Platform Independent

WHAT NEEDS TO BE DONE TO ENHANCE SITE PERFORMANCE?

The quality of a website's service depends upon several interrelated factors, such as site architecture, network capacity, and application software. E-business sites may become popular very quickly. Therefore, once the site owners are advised of the stress test results and analysis based on the predicted load, how quickly the site architecture can be scaled up becomes important.

It is important to determine what components of the site should be upgraded- database servers, Web servers, application servers, or the network link bandwidth. Maintaining the quality of services that may be compromised due to enhanced traffic requires careful analysis of the factors involved in order to find the optimum solution.

This is all the more important as many small- or medium-sized companies may not be able to afford frequent hardware upgrades or expansions.

It benefits business of all sizes to know the threshold traffic points above which their website's performance starts to deteriorate. If their predicted E-business traffic is above the threshold, as determined by stimulated load results, then only the remedial action is called for.

CONCLUSION

The new economy is characterized by an infinite number of purchasing options available right at the moment the customer learns about them. The very impulse to buy is now part of the same process. Through unprecedented levels of information exchange between individuals and organizations, the new economy has changed the way buyers and sellers find each other, compare prices and value added services, optimize business processes, and reduce costs.

Better prepared sites can significantly reduce the amount of volume burst-induced damage to site performance. Although it is difficult to predict erratic patterns of website demand, a site must be prepared for these spikes in traffic. External website load stress testing can play a significant role in providing E-businesses advanced preparations to meet such challenges.

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Performance Evaluation of Data Mining clustering algorithm in WEKA

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ABSTRACT

Data mining is a computerized technology that uses complicated algorithms to find relationships and trends in large data bases, real or perceived, previously unknown to the retailer, to promote decision support.., data mining is touted to be one of the widespread recognition of the potential for analysis of past transaction data to improve the quality of future business decisions. The purpose of this paper is to critique data mining technology in comparison with more familiar data mining algorithm in well known tool Weka for strategic decision making by small to medium size retailers. The context for this study includes current and future industry applications and practices for research performed in data mining applications within the retail sector.

KEYWORDS

WEKA	Algorithm
Cluster	Data Mining

INTRODUCTION

As the data sizes accumulated from various fields are exponentially increasing, data mining techniques that extract information from huge amount of data have become popular in commercial and scientific domains, including marketing, customer relationship management. During the evaluation, the input datasets and the number of clusterer used are varied to measure the performance of Data Mining algorithm. I present the results based on characteristics such as scalability, accuracy to identify their characteristics in a world famous Data Mining tool-WEKA.

RELATED WORK

I studied various journals and articles regarding performance evaluation of Data Mining algorithms on various different tools, some of them are described here, Ying Liu et all worked on Classification algorithms while Osama abu abbas worked on clustering algorithm, and Abdullah compared various classifiers with different types of data set on WEKA, I presented their result as well as about tool and data set which are used in performing evaluation.

Ying Liu,wei-keng Liao et all in his article "performance evaluation and characterization of scalable data mining algorithms by Ying Liu, Jayaprakash, Wei-keng, Alok chaudhary" investigated data mining applications to identify their characteristics in a sequential as well as parallel execution environment .They first establish Mine bench, a benchmarking suite containing data mining applications.

The selection principle is to include categories & applications that are commonly used in industry and are likely to be used in the future, thereby achieving a realistic representation of the existing applications. Minebench can be used by both programmers & processor designers for efficient system design. They conduct their evaluation on an Intel IA-32 multiprocessor platform, which consist of an Intel Xeon 8-way shared memory parallel(SMP) machine running Linux OS, a 4 GB shared memory & 1024 KB L2 cache for each processor. Each processor has 16 KB non-blocking integrated L1 instructions and data caches. The number of processors is varied to study the scalability.

In all the experiments, they use VTune performance analyzer for profiling the functions within their applications, & for measuring their breakdown execution times. VTune counter monitor provides a wide assortment of metrics. They look at different characteristics of the applications: execution time, fraction of time spent in the OS space, communication/synchronization complexity , & I/O complexity. The Data comprising 250,000 records. This notion denotes the dataset contains 2,00,000 transactions,the average transaction size is 20, and the average size of the maximal potentially large itemset is 6. The number of items is 1000 and the number of maximal potentially large itemset is 2000. The algorithms for comparison are ScalParc, Bayesian, K-means, Fuzzy K-means, BIRCH,HOP,Apriori, & ECLAT.

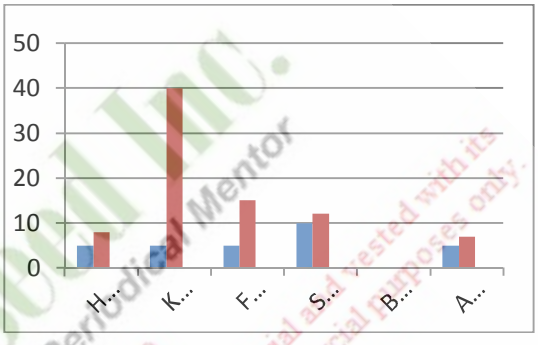

Fig 1: OS overheads of Mine Bench applications as a percentage of the total execution time.

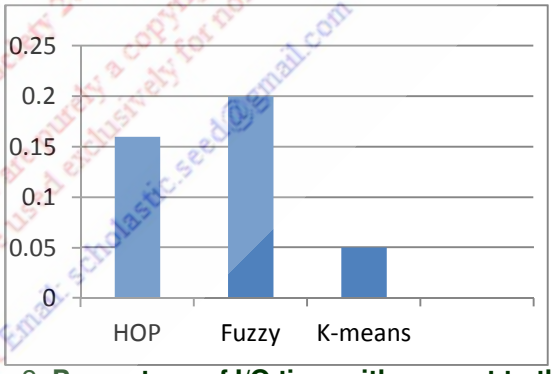

Fig 2: **Percentage of I/O time with respect to the overall execution times.**

Osama Abu Abbas in his article "comparison between data clustering algorithms by Osama Abu Abbas" compared four different clustering algorithms (K-means, hierarchical, SOM, EM) according to the size of the dataset, number of the clusters ,type of S/W. The general reasons for selecting these 4 algorithms are:

- **Popularity**
- **Flexibility**
- **Applicability**
- **Handling High dimensionality**

Osama tested all the algorithms in LNKnet S/W- it is public domain S/W made available from MIT Lincoln lab www.li.mit.edu/ist/lnknet.

For analyzing data from different data set, located at www.rana.lbl.gov/Eisensoftware.htm

The dataset that is used to test the clustering algorithms and compare among them is obtained from the site www.kdnuggets.com/dataset .This dataset is stored in an ASCII file 600 rows,60 columns with a single chart per line

1-100 normal
101-200 cyclic
201-300 increasing trend
301-400 decreasing trend
401-500 upward shift
501-600 downward shift

No. of cluster (K)	Performance			
	SOM	K-means	EM	HCA
18	59	63	62	65
16	67	71	69	74
32	78	84	84	87
64	85	89	89	92

Fig 3 : **Relationship between number of clusters and the performance of algorithm**

K=32				
Data type	SOM	K-means	EM	HCA
Random	830	910	898	850
Ideal	798	810	808	829

Fig 4 : The affect of data type on algorithm

T. velmurgun in his research paper "performance evaluation of K-means & Fuzzy C-means clustering algorithm for statistical distribution of input data points" studied the performance of K-means & Fuzzy C-means algorithms. These two algorithm are implemented and the performance is analyzed based on their clustering result quality. The behavior of both the algorithms depended on the number of data points as well as on the number of clusters. The input data points are generated by two ways, one by using normal distribution and another by applying uniform distribution (by Box-muller formula). The performance of the algorithm was investigated during different execution of the program on the input data points. The execution time for each algorithm was also analyzed and the results were compared with one another, both unsupervised clustering methods were examined to analyze based on the distance between the various input data points. The clusters were formed according to the distance between data points and clusters centers were formed for each cluster.

The implementation plan would be in two parts, one in normal distribution and other in uniform distribution of input data points. The data points in each cluster were displayed by different colors and the execution time was calculated in milliseconds.

Velmurugan and Santhanam chose 10 (k=10) clusters and 500 data points for experiment. The algorithm was repeated 500 times (for one data point one iteration) to get efficient output. The cluster centers (centroid) were calculated for each clusters by its mean value and clusters were formed depending upon the distance between data points

Cluster		1	2	3	4	5	6	7	8	9	10	Time (ms)
Run 1	N	36	47	74	47	75	26	43	50	65	37	3469
	U	45	44	41	71	37	51	38	65	47	61	3265
Run 2	N	34	34	32	71	43	71	47	81	52	35	3266
	U	60	46	53	48	57	32	63	48	48	45	3250
Run 3	N	61	49	52	38	70	28	32	49	55	56	3156
	U	59	43	43	63	52	57	41	54	45	43	3297
Run 4	N	58	24	46	40	70	41	52	50	71	48	3469
	U	39	50	54	28	63	65	61	46	47	47	3187
Run 5	N	70	29	39	67	65	41	34	53	63	39	3484
	U	59	42	55	44	51	65	52	38	59	35	3282
Run 6	N	41	48	48	34	52	68	35	42	74	58	3281
	U	50	48	46	38	58	53	42	49	51	65	3266
Run 7	N	35	44	58	43	45	43	72	36	70	54	3283
	U	49	53	43	55	58	52	58	45	45	42	3281
Run 8	N	34	55	50	69	45	39	68	57	44	39	3328
	U	51	59	58	48	51	30	41	52	59	51	3282
Run 9	N	26	53	42	41	61	63	79	68	44	23	3328
	U	45	49	56	49	62	45	49	50	48	47	3281
Run 10	N	37	34	54	60	54	58	39	59	31	74	3360
	U	36	44	46	59	41	61	50	52	53	58	3266

Fig 5 : Clusters on 500 data points

Jayaprakash et all in their paper "performance characterization of Data Mining applications using Minebench" presented a set of representative data mining applications call Minebench. They evaluated the Minebench application on an 8 way shared memory machine and analyze some important performance characteristics. Minebench encompasses many algorithms commonly formed in data mining. They analyzed the architectural properties of these applications to investigate the performance bottleneck associated with them.
For performance characterization, they chose an Intel IA-32 multiprocessor platform, Intel Xeon 8-way shared memory parallel (SMP) machine running Red Hat advanced server 2.1. The system had 4 GB of shared memory. Each processor had a 16 KB non-blocking integrated L1 cache and a 1024 KB L2 cache. For evaluation they used VTune performance analyzer. Each application was compiled with version 7.1 of the Intel C++ compiler for Linux.

The data used in experiment were either real-world data obtained from various fields or widely accepted synthetic data generated using existing tools that are used in scientific and statistical simulations. During evaluation, multiple data sizes were used to investigate the characteristics of the Minebench applications, For non-bioinformatics applications, the input datasets were classified in to 3 different sizes: small, medium, & large. IBM Quest data generator, ENZO, & real image database by corel corporation.

Reference	Goal	Database/Data description	Data size used	Preprocessing	Data Mining algorithm	Software
Abullah H. wabheh et all. (IJACSA)	Comparative study between a number og free available data mining tools	UCI repository	100 to 20,000 instances	Data integration	NB,OneR,C4.5,SVM,KNN,ZeroR	Weka,KNIME,Orange,TANAGRA
Ying Liu et all	To investigate data mining applications to identify their characteristic in a sequential as well as parallel execution environment	IBM Quest data generator,ENZO	250,000 records,2,000,000 transactions		HOP,K-means,BIRCH,ScalParc, Bayesian,Apriori,Eclat	V Tune Performance analyzer
P.T. Kavitha et all (IJCSE)	To develop efficient ARM on DDM framework	Transaction data by Point-of-Sale(PoS) system			Apriori,AprioriTID,AprioriHyprid,FP growth	Java
T.velmurugan & T.Santhanam (EJOSR)	To analyze K-means & Fuzzy C-means clustering result quality by Box-muller formula	Normal & uniform distribution of data points	500 to 1000 data points		K-means, Fuzzy C-means	Applet Viewer
Jayaprakash et all	To evaluate MineBench applications on an 8-way shared memory machine	IBM Quest data generator,ENZO , Synthetic data set	Dense database, 1000k to 8000k transcations,73MB real data set	Data cleaning	Scalparc,K-means,HOP, Apriori,Utility, SNP,Genenet,SEMPHY,Research,SVM,PLSA	V tune performance analyzer
Pramod S. & O.P.vyas	To assess the changing behavior of customers through ARM	Frequent Itemset Mining(FIM) data set repository	Sorted & unsorted transaction set	Data cleaning	CARMA,DSCA,estDec	java
Osama abu Abbas	To compare 4 clustering algorithm	www.kdnuggets.com	ASCII file 600 rows 60 columns		K-means,hierarchical,SOM, EM	LNKnet

Table 1 : Summary of selected references with goals

As the number of available tools continues to grow, the choice of one special tool becomes increasingly difficult for each potential user. This decision making process can be supported by performance evaluation of various clusterers used in open source data mining tool –Weka.

ANALYSIS OF DATA MINING ALGORITHM

Clustering Program

Clustering is the process of discovering the groups of similar objects from a database to characterize the underlying data distribution. K-means is a partition based method and arguably the most commonly used clustering technique. K-means clusterer assigns each object to its nearest cluster center based on some similarity function. Once the assignment are completed , new centers are found by the mean of all the objects in each cluster.

BIRCH is a hierarchical clustering method that employs a hierarchical tree to represent the closeness of data objects. BIRCH first scans the database to build a clustering-feature tree to summarize the cluster representation. Density based methods grow clusters according to some other density function. DBscan , originally proposed in astrophysics is a typical density based clustering method.

After assigning an estimation of its density for each particle with its densest neighbors, the assignment process continues until the densest neighbor of a particle is itself. All particles reaching this state are clustered as a group.

EVALUATION STRATEGY/METHODOLOGY

H/W tools

I conduct my evaluation on Pentium 4 Processor platform which consist of 512 MB memory, Linux enterprise server operating system, a 40GB memory, & 1024kbL1 cache.

S/W tool

In all the experiments, I used Weka 3-6-6, I looked at different characteristics of the applications-using classifiers to measure the accuracy in different data sets, using clusterer to generate number of clusters, time taken to build models etc.

Weka toolkit is a widely used toolkit for machine learning and data mining that was originally developed at the university of Waikato in New Zealand . It contains large collection of state-of-the-art machine learning and data mining algorithms written in Java. Weka contains tools for regression, classification, clustering, association rules, visualization, and data processing.

Input data sets

Input data is an integral part of data mining applications. The data used in my experiment is either real-world data obtained from UCI data repository and widely accepted dataset available in Weka toolkit, during evaluation multiple data sizes were used, each dataset is described by the data type being used, the types of attributes, the number of instances stored within the dataset, also the table demonstrates that all the selected data sets are used for the classification and clustering task. These datasets were chosen because they have different characteristics and have addressed different areas.

Zoo dataset and Letter image recognition dataset are in csv format whereas labor ,and Supermarket dataset are in arff format. Zoo, Letter, & Labor dataset have 17 number of attributes while Supermarket dataset has 200 attributes. Zoo dataset encompasses 101 instances, Letter image contains 20000 instances but I taken just 174 instances. Labor comprises 57 instances, & Supermarket has 4627 instances. All datasets are categorical and integer with multivariate characteristics.

Experimental result and Discussion

To evaluate the selected tool using the given datasets, several experiments are conducted. For evaluation purpose, two test modes are used, the Full training set & percentage split(holdout method) mode. The training set refers to a widely used experimental testing procedure where the database is randomly divided in to k disjoint blocks of objects, then the data mining algorithm is trained using k-1 blocks and the remaining block is used to test the performance of the algorithm, this process is repeated k times. At the end, the recorded measures are averaged. It is common to choose

k=10 or any other size depending mainly on the size of the original dataset.

In percentage split (holdout method) ,the database is randomly split in to two disjoint datasets. The first set, which the data mining system tries to extract knowledge from called training set. The extracted knowledge may be tested against the second set which is called test set, it is common to randomly split a data set under the mining task in to 2 parts. It is common to have 66% of the objects of the original database as a training set and the rest of objects as a test set. Once the tests is carried out using the selected datasets, then using the available classification and test modes ,results are collected and an overall comparison is conducted.

Performance Measures

For each characteristic, I analyzed how the results vary whenever test mode is changed. My measure of interest includes the analysis of clusterers on different datasets, the results are described in value number of cluster generated, clustered instances, time taken to build the model, and unclustered instances. after applying the cross-validation or holdout method.

For performance issues, There are 3 other datasets which I used for measurement they are Letter image recognition, labor, & Supermarket dataset. The details of applied classifiers on those datasets are as following:

Dataset: Letter image recognition
Classifier: Lazy-IBK,KStar, Tree-Decision stump, REP, Function- Linear regression, Rule-ZeroR
Dataset: Labor
Classifier: Lazy-IBK,KStar, Tree-Decision stump, REP, Function- Linear regression, Rule-ZeroR, Bayesian-Naïve Bayes
Dataset: Supermarket
Classifier: Lazy-IBK,KStar, Tree-Decision stump, CART, Function- SMO, Rule-ZeroR, OneR, Bayesion-Naïve Bayes.

The details of clusterer with different dataset are as following

- Dataset: Zoo
- Clusterer: DBscan, EM, Hierarchical, K-means
- Dataset: Letter image recognition
- Clusterer: DBscan, EM, Hierarchical, K-means
    - Dataset: Labor: Clusterer: DBscan, EM, Hierarchical, K-means
    - Dataset: Supermarket: Clusterer: DBscan, EM,, K-means

Clustering in Weka:-

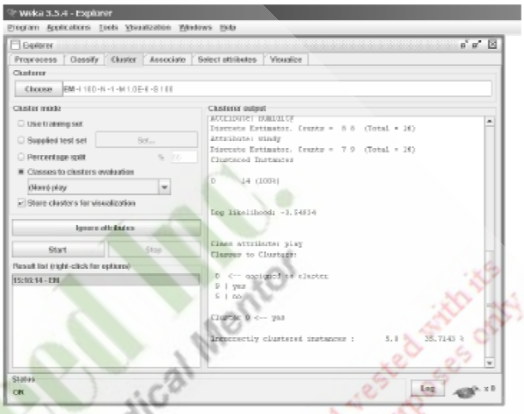

Fig 6 : Clustering window

- ***Selecting a Cluster:*** By now you will be familiar with the process of selecting and configuring objects. Clicking on the clustering scheme listed in the Clusterer box at the top of the window brings up a Generic Object Editor dialog with which to choose a new clustering scheme

- ***Cluster Modes:*** The Cluster mode box is used to choose what to cluster and how to evaluate the results. The first three options are the same as for classification: Use train- ing set, Supplied test set and Percentage split except that now the data is assigned to clusters instead of trying to predict a specific class. The fourth mode, Classes to clusters evaluation, compares how well the chosen clusters match up with a pre-assigned class in the data. The drop-down box below this option selects the class, just as in the Classify pane

- ***Ignoring Attributes:*** Often, some attributes in the data should be ignored when clustering. The Ignore attributes button brings up a small window that allows you to select which attributes are ignored. Clicking on an attribute in the window highlights it, holding down the SHIFT

key selects a range of consecutive attributes, and holding down CTRL toggles individual attributes on and off. To cancel the selection, back out with the Cancel button. To activate it, click the Select button.

Working with Filters

The Filtered meta-clusterer offers the user the possibility to apply filters directly before the clusterer is learned. This approach eliminates the manual application of a filter in the Preprocess panel, since the data gets processed on the fly. Useful if one needs to try out different filter setups.

Learning Clusters

The Cluster section, like the Classify section, has Start/Stop buttons, a result text area and a result list. These all behave just like their classification counterparts. Right-clicking an entry in the result list brings up a similar menu, except that it shows only two visualization options: Visualize cluster assignments and Visualize tree.

DETAILS OF DATA SET

I used 4 data set for evaluation with clustering in WEKA ,Two of them from UCI Data repository that are Zoo data set and Letter image recognition, rest two labor data set and supermarket data set is inbuilt in WEKA 3-6-6 .Zoo data set and letter image recognition are in csv file format ,and labor and supermarket data set are in arff file format.
Detail of data set used in evaluation:--

Table 2 : Detail of data set

ZOO DATA SET

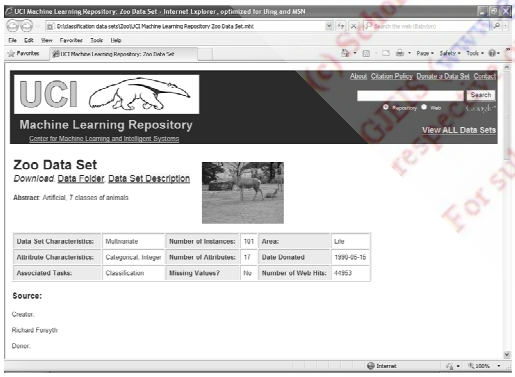

Fig 7 : Zoo data set (UCI repository.)

. Title: Zoo database
. Source Information
-- Creator: Richard Forsyth
-- Donor: Richard S. Forsyth
8 Grosvenor Avenue
Mapperley Park
Nottingham NG3 5DX
0602-621676
-- Date: 5/15/1990

Relevant Information:

-- A simple database containing 17 Boolean-valued attributes. The "type" attribute appears to be the class attribute. Here is a breakdown of which animals are in which type: (I find it unusual that there are 2 instances of "frog" and one of "girl"!) Class# **Set of animals**

1 (41) aardvark, antelope, bear, boar, buffalo, calf, cavy, cheetah, deer, dolphin, elephant, fruitbat, giraffe, girl, goat, gorilla, hamster, hare, leopard, lion, lynx, mink, mole, mongoose, opossum, oryx, platypus, polecat, pony, porpoise, puma, pussycat, raccoon, reindeer, seal, sealion, squirrel, vampire, vole, wallaby, wolf

Name of Data set	Type of file	Number of attributes	Number of instances	Attribute characteristics	Dataset characteristics	Missing value
Zoo	CSV(comma separated value)	17	101	Categorical,Integer	Multivariate	No
Letter Image Recognition	CSV(comma separated value)	17	174/20000	Categorical,Integer	Multivariate	No
Labor	ARFF(Attribute Relation File Format)	17	57	Categorical,Integer	Multivariate	No
Supermarket	ARFF(Attribute Relation File Format)	217	4627	Categorical,Integer	Multivariate	No

2 (20) chicken, crow, dove, duck, flamingo, gull, hawk, kiwi, lark, ostrich, parakeet, penguin, pheasant, rhea, skimmer, skua, sparrow, swan, vulture, wren

3 (5) pitviper, seasnake, slowworm, tortoise, tuatara

4 (13) bass, carp, catfish, chub, dogfish, haddock, herring, pike, piranha, seahorse, sole, stingray, tuna

5 (4) frog, frog, newt, toad

6 (8) flea, gnat, honeybee, housefly, ladybird, moth, termite, wasp

7 (10) clam, crab, crayfish, lobster, octopus, scorpion, seawasp, slug, starfish, worm

Number of Instances: 101

Number of Attributes: 18 (animal name, 15 Boolean attributes, 2 numerics)

Attribute Information: (name of attribute and type of value domain)

○ **Animal name:**	**Unique for each instance**
○ **hair**	**Boolean**
○ **feathers**	**Boolean**
○ **eggs**	**Boolean**
○ **milk**	**Boolean**
○ **airborne**	**Boolean**
○ **aquatic**	**Boolean**
○ **predator**	**Boolean**
○ **toothed**	**Boolean**
○ **backbone**	**Boolean**
○ **breathes**	**Boolean**
○ **venomous**	**Boolean**
○ **fins**	**Boolean**
○ **legs**	**Numeric (set of values:**
○ **tail**	**Boolean**
○ **domestic**	**Boolean**
○ **catsize**	**Boolean**
○ **type**	

numeric (integer values in range [1,7])

8. Missing Attribute Values: None

9. Class Distribution: Given above

Letter image recognition data set :-

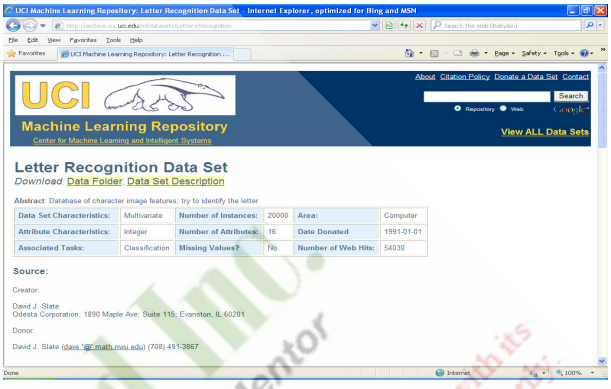

Fig 8: Letter image recognition data set

Title: Letter Image Recognition Data
Source Information
-- Creator: David J. Slate
-- Odesta Corporation; 1890 Maple Ave; Suite 115; Evanston, IL 60201
-- Donor: David J. Slate (dave@math.nwu.edu) (708) 491-3867
-- Date: January, 1991

Past Usage: "Letter Recognition Using Holland-style Adaptive Classifiers".

The research for this article investigated the ability of several variations of Holland-style adaptive classifier systems to learn to correctly guess the letter categories associated with vectors of 16 integer attributes extracted from raster scan images of the letters. The best accuracy obtained was a little over 80%. It would be interesting to see how well other methods do with the same data.

RELEVANT INFORMATION

The objective is to identify each of a large number of black-and-white rectangular pixel displays as one of the 26 capital letters in the English alphabet. The character images were based on 20 different fonts and each letter within these 20 fonts was randomly distorted to produce a file of 20,000 unique stimuli. Each stimulus was converted into 16 primitive numerical attributes (statistical moments and edge counts) which were then scaled to fit into a range of integer values from 0 through 15. We typically train on the first 16000 items and then use the resulting model to predict the letter category for the remaining 4000. See the article cited above for more details.

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered
DBscan	108	Full training data	1	6(100%)	0.04 second	102
EM	108	Full training data	6(8,12,13,22, 20,33)	6(7%,11%,13%,12%,20%, 19%,31%)	3.54 second	0
Hierarchical	108	Full training data	1	108(100%)	0.03 second	0
k-means	108	Full training data	2(40,68)	2(37%,63%)	0.01 second	0

Number of Instances: 20000

Number of Attributes: 17 (Letter category and 16 numeric features)

Attribute Information:

- lettr capital letter (26 values from A to Z)
- x-box horizontal position of box (integer)
- y-box vertical position of box (integer)
- width width of box (integer)
- high height of box (integer)
- onpix total # on pixels (integer)
- x-bar mean x of on pixels in box (integer)
- x2bar mean x variance (integer)
- y2bar mean y variance (integer)
- xybar mean x y correlation (integer)
- x2ybr mean of x * x * y (integer)
- xy2br mean of x * y * y (integer)
- x-ege mean edge count left to right (integer)
- xegvy correlation of x-ege with y (integer)
- y-ege mean edge count bottom to top (integer)
- yegvx correlation of y-ege with x (integer)
- y-bar mean y of on pixels in box (integer)

Missing Attribute Values: None

Class Distribution:

789 A	766 B	736 C	805 D	768 E
775 F	773 G	734 H	755 I	747 J
739 K	761 L	792 M	783 N	753 O
803 P	783 Q	758 R	748 S	796 T
813 U	764 V	752 W	787 X	786 Y
734 Z				

Evaluation of Clusterer on various data set:

Evaluation of Clusterer on Zoo data set:-

Table 3 : Evaluation of clusterer on Zoo data set with Full training data test mode

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered instances
DBscan	108	Percenatge split	0	0	0.02 second	37
EM	108	Percenatge split	5(5,5,10,12,5)	5(14%,27%,14%,14%,32%)	1.58 second	0
Hierarchical	108	Percenatge split	2(0,37)	2(100%)	0.01 second	0
k-means	108	Percenatge split	2(8,29)	2(22%,78%)	0 second	0

Table 4 : Evaluation of clusterer on Zoo data set with percentage split test mode

7.2 Evaluation of Clusterer on Letter Image Recognition data set:-

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered instances

DBscan	174	Full training data	1	6(100%)	0.09 second	168
EM	174	Full training data	6(56, 25, 6,28,40, 19)	6(32%,14%, 3%,16%,23%,11%)	10.92 second	0
Hierarchical	174	Full training data	1	1(100%)	0.06 second	0
k-means	174	Full training data	2(69, 105)	2(40%,60%)	0.1 second	0

Table 5 : Evaluation of clusterer on Letter image recognition with Full training data test mode

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered instances
DBscan	174	Percenatge split	0	0	0.04 second	60
EM	174	Percenatge split	4(3,23,15,19)	4(5%,38%, 25%,32%)	3.91 second	0
Hierarchical	174	Percenatge split	1(60)	1(100%)	0.02 second	0
k-means	174	Percenatge split	2(40, 20)	2(67%,33%)	0 .01 second	0

Table 6: Evaluation of clusterer on Letter image recognition with percentage split test mode

7.3 Evaluation of Clusterer on Labor data set:-

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered instances
DBscan	57	Percenatge split	0	0	0	20
EM	57	Percenatge split	3(4, 12,4)	3(20%,60%,20%)	0.54 second	0
Hierarchical	57	Percenatge split	2(0,20)	2(100%)	0	0
k-means	57	Percenatge split	2(9, 11)	2(45%,55%)	0	0

Table 7: Evaluation of clusterer on Labor data set with percentage split test mode

Clustering Algorithm	No. of Instances	Test mode	No. of cluster generated	Clustered instances	Time taken to build the model	Unclustered instances
DBscan	57	Full training	0	0	0.02 second	57
EM	57	Full training	3(14, 7,36)	3(25%,12%,63%)	0.69 second	0
Hierarchical	57	Full training	2(0,57)	1(100%)	0.02 second	0
k-means	57	Full training	2(48, 9)	2(84%,16%)	0 second	0

Table 8 : Evaluation of clusterer on Labor data set with Full training data test mode

7.4 Evaluation of Clusterer on Supermarket data set:-

Clustering Algorithm	Instances	No. of cluster generated	Clustered instances	Uncluster ed instances	Test mode	Time taken to build model
DBscan	4627	2(1007,567)	2(64%,36%)	0	Percentage split	0.23 second
EM	4627	2(0,1574)	2(100%)	0	Percentage split	102.29 second
K-means	4627	2(987,587)	2(63%,37%)	0	Percentage split	0.61 second

Table 9 : Evaluation of clusterer on supermarket data set with percentage split test mode

Clustering Algorithm (clusterer)	Instances	No. of cluster generated	Clustered instances	Unclustered instances	Test mode	Time taken to build model
DBscan	4627	2(1679,2948)	2(36%,64%)	0	Full training data	0.37 second
EM	4627	2(0,4627)	2(100%)	0	Full training data	159.54 second
K-means	4627	2(1679,2948)	2(36%,64%)	0	Full training data	1.06 second

Table 10 : Evaluation of clusterer on supermarket data set with Full training test mode

Result of Experiments in Weka

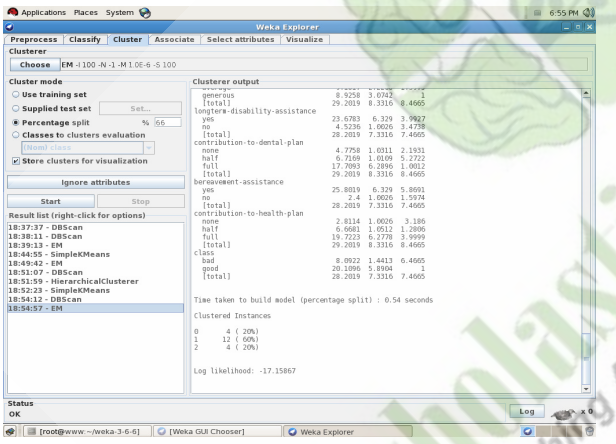

Fig 9: EMclusterer with percentage split test on labor data

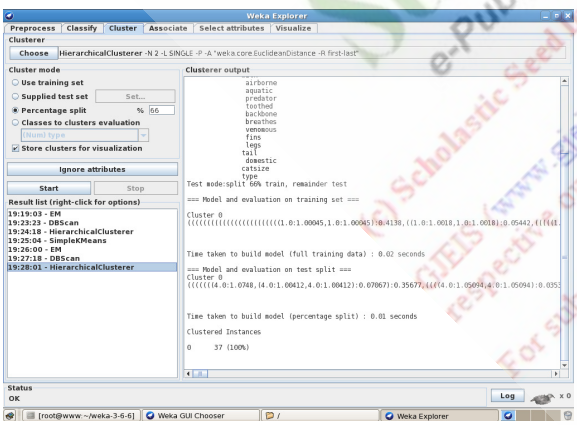

Fig 10: Hierarchical clusterer with percentage split test on zoodata

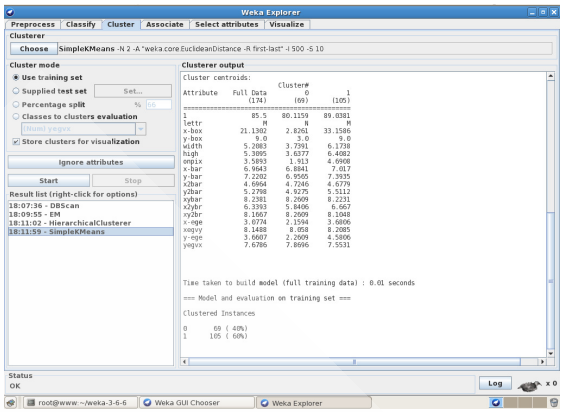

Fig 11: Kmeans clusterer with training set with letter data

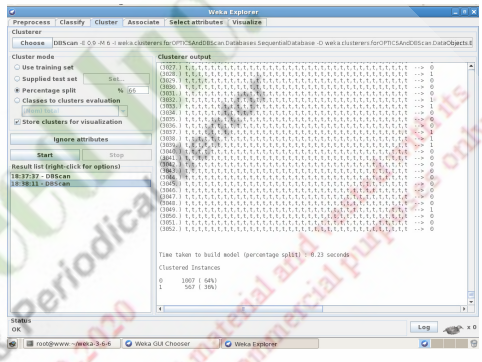

Fig 12:DBscan clusterer on supermarket data with percentage split

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Two Player Decision Behaviors Changing in Repeated Game

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ABSTRACT

This paper studies Stackelberg model in repeated game with the learning attitude of the follower and leader-follower. Leader player (firm-A) and follower player (firm-B) produce the homogeneous good in initial period. Follower does not want to be a follower always, but want to work with equal profit gainer at least. In finite periods play, both firms tent to produce the homogeneous good as per Cournot Game due to having leader-firm's farsightedness in production of good. Both the Firms collude and produce less than Nash-Cournot equilibrium to maximize its profit in each period.

KEYWORDS

Stackelberg game	Cournot game
SPE	Repeated game

INTRODUCTION

Game theory is a mathematical tool through which game situations determine a final outcome to the conflict. Each one participating like a player can control the situation partially, but any player has complete control. Each player has certain personal preferences about the possible outcome of the game and he makes an effort to obtain the most beneficial outcome for him, but he knows that the other ones make the same thing (this is rationality). It is well known that it is more advantageous for a firm to be a leader than a follower in Stackelberg duopoly without product differentiation. Stackelberg's book "Marktform und Gleichgewicht" (1934) proposes a sequential model of market economy including one leader and one follower. The leader moves first and makes her decision taking into consideration the reaction of the follower. The leader knows the demand function and her rival reaction function. The follower also knows the demand function and can set his own output level according to any possible function of the quantity set by the leader, with the expectation that the leader will not counter-react. Similarly, the leader may expect the follower to conform to the choices given by his reaction function. At Stackelberg equilibrium, both firms optimize given their beliefs and the frims' beliefs are self-fulfilled for these equilibrium choices (Tirole 1988, Vives 1999).

The standard Stackelberg oligopoly equilibrium model may be conceived as a subgame perfect Nash equilibrium of a two stage game, where each player moves in a prescribed order (Fudenberg and Tirole 1991; Osborne and Rubinstein 1994). One salient feature of Stackelberg duopoly model when frims compete on quantity is the following: under both assumptions of linear market demand and constant identical marginal costs, the leader always achieves a higher payment than the follower. However, tackled in a T-stage game, with one firm per stage, the Stackelberg model may generate a situation in which the Cournot profit may exceed the leader's profit (Anderson and Engers 1992). In this model the Stackelberg price becomes arbitrarily small relative to the Cournot price as the number of firms (stages) becomes large, and this effect dominates the large output of the first leader.

Gal-Or (1985) shows that a leader obtains relatively higher profits when the slope of firms' reaction functions is negative, while Dowrick (1986) shows the opposite when these slopes are positive. We rather focus on the conditions on the slope of the followers' reaction functions as rationally expected by the leaders. It enables to circumvent the conditions under which leaders may achieve better payments than followers. Daughety (1990) considers a parameterized class of Stackelberg markets and shows that all sequential-move structures are beneficial compared to the simultaneous-move Cournot markets.

The objective of this paper is threefold. First, we see the reaction of the leader and follower firm to produce the output of homogeneous good in initial stage, subject to some plausible market assumptions. Second, we study the learning behavior of the follower and leader-follower in t - stage (learning curve (Yelle, 1979)) supply a homogeneous product in Cournot game with its rival

firm in a noncooperative manner. Third, Leader's farsightedness and regular learning of the follower-firm maximize the profit of both in each stage of the game. Farsightedness of the firms makes them collude to maximize upto infinite periods.

Our results are supported by the Example: the level of output increases, Stackelberg markets yield higher output, higher consumer rents and higher welfare levels than Cournot markets. We find considerable deviations from the subgame perfect equilibrium prediction in Stackelberg markets to Cournot output.

The remainder of the paper is organized as follows: Section 1 introduction the Stackelberg model and its different results, interrelationship of the Cournot game and sequential move game Stackelberg. In this Section 2, we introduce notations, assumptions, definitions, preliminary concepts. Section 3 provides the model of the game and graphical presentation of results. Section 4 provides the examples which illustrate the deviation of the follower to use the learning strategy with respect to the maximizing profit of the leader. Section 5 presents the conclusion of the paper.

.

PRELIMINARIES OF TWO PLAYERS GAME

Let $\Gamma=(Q_1, Q_2: \pi_1, \pi_2)$ be 2-player game, where $i = (1,2)$ is the set of players.Q_i is the set of actions of player i and $\pi_i: Q_1 \times Q_2 \rightarrow \mathbb{R}$ is player i 's payoff function.

The associated infinitely repeated game with discounting is denoted by $\Gamma^{\infty}(\delta)$ $where$ $\delta \in (0,1)$ is the discounted factor. If $Q(t) = (Q_1(t), Q_2(t))$ is the vector of action played in period t, then $\{Q(t), \ldots Q(t)\}$ is a history h of length. A pure strategy σ_i of player i in $\Gamma^{\infty}(\delta)$ is a sequence of function σ_i^t or $\sigma_i(t)$ from the set of all histories of length $(t-1)$ to Q_i so $\sigma_i^1 \in Q_i$ is the initial action of player i.

A stream of action profile $\{Q(t)\}_{t=1}^{\infty}$ is reffered to as an outcome path and is denoted by S any strategy profile$\sigma = (\sigma_1, \sigma_2)$ generates an outcome path $S(\sigma) = \{Q(t)\}_{t=1}^{\infty}$ defined inductively by $Q(\sigma)(1) = \sigma^1.Q(\sigma)(t) = \sigma^t\big(Q(\sigma)(1), \ldots, Q(\sigma)(t-1)\big)$ if $t > 1$. The value $\pi_i(Q(t)$ denotes the payoff of player i in period t when the outcome in this period is $Q(t)$ and $\pi_i^{\delta}(S)$ denotes the averages discounted payoff of player i for the outcome path $S = \{Q(t)\}_{t=1}^{\infty}$:$\pi_i^{\delta}(S) = (1-\delta)\sum_{t=1}^{\infty}\delta^{t-1}\pi_i(q(t))$ then ,the averages discounted payoff of player i in $\Gamma^{\infty}(\delta)$ obtained with the strategy profile $\sigma = (\sigma_1, \sigma_2)$ is $\pi_i^{\delta}(\sigma) = \pi_i^{\delta}(S(\sigma))$. A strategy profile $\sigma = (\sigma_1, \sigma_2)$ is a Nash Equilibrium in $\Gamma^{\infty}(\delta)$ if for $i = (1,2), \sigma_1$ is a best response σ_2. And it is a Subgame Perfect Equilibrium (SPE) in $\Gamma^{\infty}(\delta)$ if after every historyh, σ_h(i.e. the continuation of σ after h) is a Nash equilibrium in the corresponding subgame.

Assumptions: In the specific game we consider the Cournot Model with perfect monitoring. two firms produce a homogeneous good at cost function $C(Q) > 0$. The industry inverse demand function is denoted by $P(Q)$ and payoff function is denoted by $\pi_i(q_1, q_2) = \big(P(.)\big)q_i - C(.)q_i$, where q_i is the output of the firm i.

A.1: Inverse Demand Function $P(.): \Re_+ \rightarrow \Re_+$ is continuous, differential and with $P'(Q) < 0$ for $\forall$ $Q > 0$ such that $P(Q) > 0, \lim_{q\to\infty} P(Q) = 0$ and $P(0) > c$. Let

$Q_1^D(Q_2)$ be a single period best response to Q_2 that is $Q_1^D(Q_2)$ satisfy $\pi_1(Q_1, Q_2^D) \geq \pi_1(Q_1, Q_2)$ for $\forall\, q_1 \in Q_1$.

A.2: $Q_1^D(Q_2)$is well defined, unique and$Q^D(q) = q_1^D(q_2)$, where $q = q_2$ is a continuous, non-increasing function. Let $\pi_i^D(q)$be player *i's* best response payoff when other player play according to q_2, that is $\pi_i^D(q) = \pi_i(q_1, q_i^D(q_2))$.

A3: Learning function of the firm is $v_t = v_1 t^{\log\phi/\log 2}$, $where\ 0 \leq \phi \leq 1$ is firm's learning parameter and t is period of the game. Learning aspect generates the farsightedness and come together to produce meet the demand.

MODEL OF THE GAME

In this section we review the basic results of Both Cournot and Stackelberg game in a static linear demand at Initial Period, $i = 1, 2$ number of player (1-Leader and 1-Follower).Marginal cost of firm $i = c_i(t)$ Market demand $p(t) = a - bq(t)$,where *q* is the quantity, and *a and b* parameters. In Cournot Competition, the firms play a quantity-setting game with simultaneous moves. In case of Stackelberg Competition, the firms play also a quantity setting game with sequential move, Stackelberg –Leader move first, Follower-firm play its best response then they produce the quantity non-negative amounts. In Cournot Model, Equilibrium

$q_2^*(t) = (a + c_1 - 2c_2)/3b\,(t)$,

$q_1^*(t) = (a + c_2 - 2c_1)/3b\,(t)$ and Profit function

$\pi_1(t) = (a + c_2 - c_1)^2/9b(t)$

, $\pi_2(t) = (a + c_1 - c_2)^2/9b\,(t)$

and price of the quantity $p(t) = (a + c_1 + c_2)/3\,(t)$. and In Stackelberg model, Equilibrium,$q_L^*(t) = (a + c_2 - 2c_1)/2b(t)$, $q_F^*(t) = (a + c_1 - 2c_2)/2b(t)$, and profit function $\pi_L(t) = (a + c_2 - 2c_1)^2/8b\,(t)$, $\pi_F(t) = (a + 2c_1 - c_2)^2/16b\,(t)$ and price of the quantity $p(t) = (a + 2c_1 + c_2)/4\,(t)$.

Learning curve of the firm [Yelle, 1979]: $v_t = v1t\log\phi\log 2$, *where 0≤ϕ≤1*

Leader produces q_L^* in S-game in $t = 1$ period and q_L in $t = T - 1$ period.

$q_L(t = T - 1) \in (q^*, q_L^*)$, $q^* < q_L < q_L^*$, and $\pi_L(q^*, q^*)(t = T) < \pi_L\big(q_L, B(q_L)\big)(T - 1) < \pi_L(q_L^*, q_F^*)(t = 1)$, Follower produces q_F^* in S-game in $t = 1$ period and q_F in $t = T - 1$ period. $q_F(t = T - 1) \in (q_F^*, q^*)$.

$q_F^* < q_F < q^*$ and $\pi_F(q^*, q^*)(t = T) > \pi_F(q_L, q_F =$ *BqLT−1>πFqL∗,qF∗(t=1)*

Leader-firm have a farsightedness aspect due to Follower-firm's learning, Leader offer its agreement to the follower to produce more quantity than one period. If this agreement increases in total profit K then follower-firm has to share this Extra profit (Fig: 1) as per agreeing offered conditions by the leader-firm ($x\ is\ an\ arbitrary$). To get this profit leader firm agree to share in cost of extra units by follower-firm

$$\left(\frac{K}{2} + x\right) \quad x \quad \left(\frac{K}{2} - x\right)$$

$$\textbf{Follower's Extra Profit}, \textbf{leader's Extra Profit}$$

Fig: 1 (Extra Profit sharing in between Stackelberg leader and Stackelberg follower-firm)

After Agreement: Both firms increase its profit in $t = T - 1$ periods and make share of it.

Leader-firm's profit be higher after adding gain from agreement with the follower-firm-

$$\pi_L(q_L, q_F) + \left(\frac{K}{2} - x\right) \geq \pi_L(q_L^*, q_F^*)$$

Follower-firm's profit be higher after adding gain from agreement with the leader-firm-

$$\pi_F(q_L, q_F) = \left(\frac{K}{2} + x\right) + \pi_F(q_L^*, q_F^*)$$

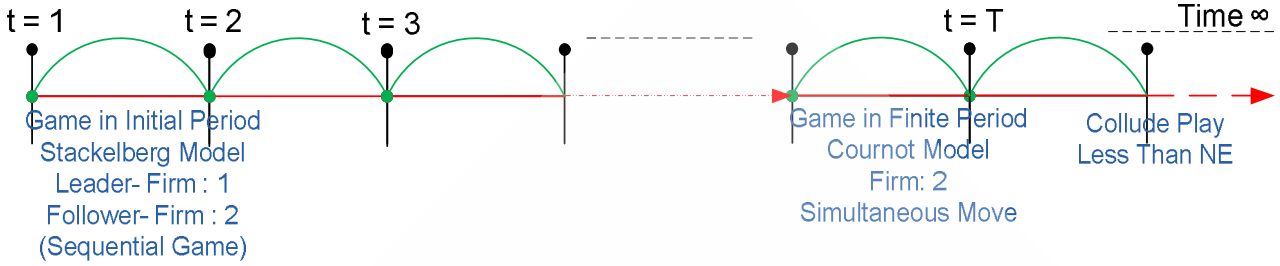
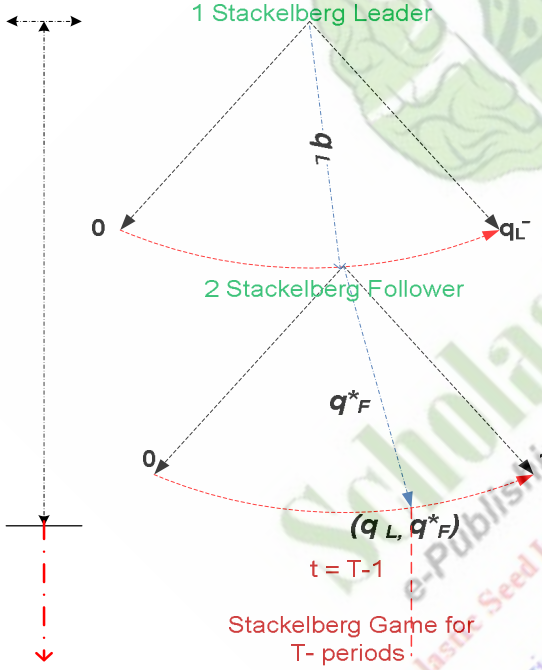


Fig: 2 (Model of the Game, upto $t = T - 1$ periods S-game for $t = T$ period C-game and firms' collusion for infinity to maximize profit)



i) (S-game for $t = T - 1$ periods)

Farsightedness of the leader and observation on the follower's regular learning, convert game into Cournot-game and both inclined to collude for the maximization of its profit. Produce less than N-Cournot equilibrium which maximizes its profit to play upto infinity (Fig: 2).

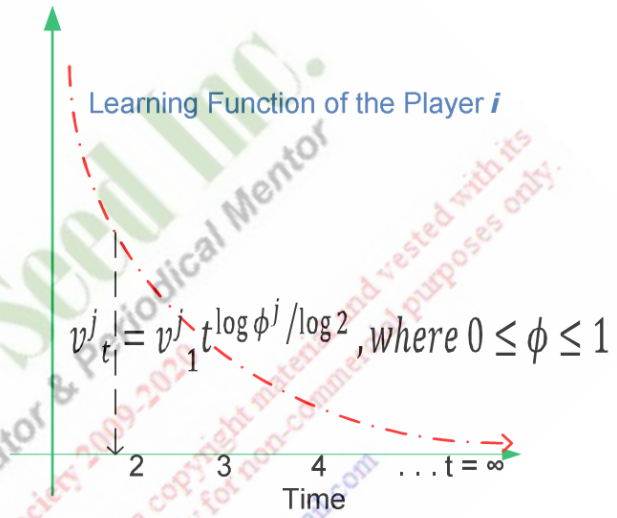


Fig: 3- ii) Firm's learning curve in each period

Following fig: 4 i) follower-firm achieve the leader's learning in period $(t = T)$, just before it both firm agree to play as per S-game and in this period firms agree to play simultaneous game (C-game). When both leader and follower have dynamic regular learning play simultaneous game in periods $(t = T - 1$ (fig: 4 ii).

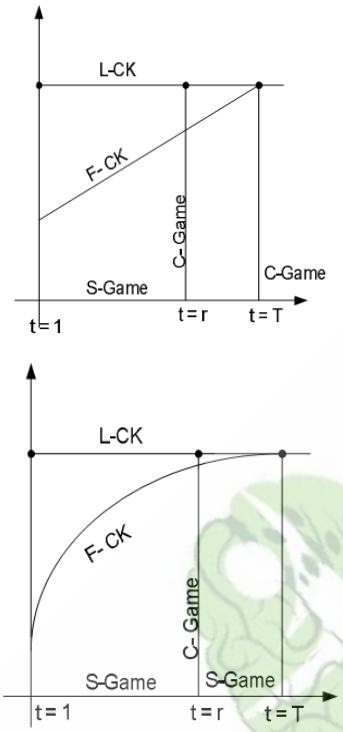


Fig: 4 i) leader and follower's learning

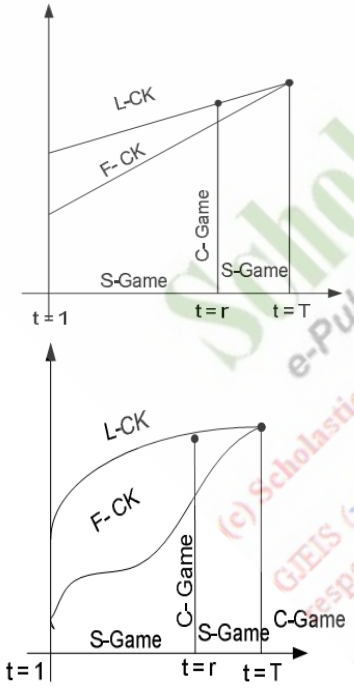


Fig: 4 ii) leader and follower's learning

Example: Player: Firm 1, Firm 2, linear inverse demand function: $P(Q = q_1 + q_2)(t) = (30 - Q)(t)$

Linear cost function: $C_i(q_i)(t) = 6q_i(t), i = 1,2.$

In Cournot market:$\pi_1\,(q_1\,, q_2)(t) = q_1(P(Q) - Ct{=}q130{-}6{-}q1{-}q2(t),\ if\ Q{\leq}30$, To find out firm 1's best response to any given output q_2 of firm 2.we need to study firm 1's profit as a function of its output q_1 for given$q_2 = q_2^*.\pi_1^{'}(q_1, q_2^*) = \frac{\partial}{\partial q_1}\{q_1(24 - q1{-}q2{*}{=}0$, then $q1at\ given\ q2{*} = 12\ (24{-}q2{*})$, due to similarity of $q_2 = \frac{1}{2}\,(24 - q_1^*)$, putting the best responses, we get Nash equilibrium $(q_1^*,\ q_2^*)(t)$ =8,Total produced quantity $Q = 2 \times q_1^* = 16, P(Q) = 30 - 16 = 14, \pi_i^t = 8 \times 8 = 64$,cunsumer surplus =128 and total welfare=256.

In Stackelberg market: Firms {leader (L), follower (F)} choose their quantities sequentially. Stackelberg leader (L) decides on its quantities q_1^L ,it is a game of complete information, knowing q_1^L - Stackelberg follower (F) decides on its quantity q_2^F. Leader firm's strategy to produce = q_1,

Follower firm's strategy to play his best response at given $q_1, q_2 = \frac{1}{2}\,(24 - q_1^*)(t)$, now first order condition at profit function $\pi_1^{'}\,(q_1, q_2)(t) = \frac{\partial}{\partial q_1}\{\frac{1}{2}q_1(24 - q_1)(t) = 0\ \Rightarrow$

$q_1(t) = 12, and\ q_2(t) = 6$, total produced quantity $Q = q_1 + q_2 = 12 + 6 = 18$, profits of the Stackelberg Leader firm $\pi_1^L(t) = 72$, profit of the Stackelberg follower firm , $\pi_2^F(t) = 36$, consumer surplus = 162, and total welfare = 270.

Quantity comparison of the first player (Stackelberg leader firm and Cournot firm)-

$q_{1_{SL}}^*\,(t) > q_{1_{CF}}^*(t)$ (i)

Quantity comparison of second player (Stackelberg follower firm and Cournot firm)-

$q^*_{2_{SF}}(t) < q^*_{2_{CF}}(t)$ (ii)

Total Quantity comparison-

$(Q_{SE} = q^*_{1_{SL}} + q^*_{2_{SF}})(t) > (Q_{CE} = q^*_{1_{CF}} + q^*_{2_{CF}})(t)$ (iii)

Payoff comparison of the first player (Stackelberg leader firm and Cournot firm)-

$\pi_{SL}(q^*_{1_{SL}}, q^*_{2_{SF}})(t) > \pi_C(q^*_{1_{CF}}, q^*_{2_{CF}})(t)$ (a)

Payoff comparison of the Second player (Stackelberg follower firm and Cournot firm)-

$\pi_{SF}(q^*_{1_{SL}}, q^*_{2_{SF}})(t) > \pi_C(q^*_{1_{CF}}, q^*_{2_{CF}})(t)$ (b)

Total Payoff comparison in Stackelberg and Cournot game-

$\pi(q^*_{1_{SL}}, q^*_{2_{SF}})(t) > \pi(q^*_{1_{CF}}, q^*_{2_{CF}})(t)$ (c)

Total welfare comparison in Stackelberg and Cournot game-

$TW_{SE}(t) > TW_{CE}(t$ (d)

Simple to observe the result of the firms in t-period, Firms are the firms which produce the homogeneous good for the welfare of the firms in long run aspect, at least Stackelberg leader have farsightedness to produce the good which inclined to welfare of the firm only to compete the market demand. in initial period, firms play Stackelberg game, in which leader firm are inclined to maximize its profit but unable to fulfill market demand, declaring its quantity to produce -knowing the quantity decided by the leader firm, follower firm choose its best response quantity which maximize its profit in t-period.

Above results shows: Total profit in S-game in initial stage is less than the profit in C-game on which firms inclined to make it own in ($t = T$). Learning and farsightedness of the firms give this opportunity to maximize the profit without loss of generality. Further collusion of the firms increases the profit with long run play. Joint-profit maximization implies, $q_{i=1}(t) = 6, Q = q_1 + q_2 = 12,\ \pi_{i=1}(t) = 72$. Long run aspect of the firms makes it possible to maximize its profit with the agreement process.

CONCLUSION

In this paper, we have drawn the firms' aspect to maximize its profit without worrying about the total social welfare reduced in each period. Firms' long run play makes heavy loss in social welfare of the society repeatedly. Firm play with co-operation only with competitive the firm which can leave behind in future rationally. Here it is a difficult to define which firm is leader and which one is the follower. As in studied paper, Leader-follower firm are distinct due to having some basic economic ability to produce a wide range of outputs with reasonable profit margin and their size. We can distinct the leader and follower by emerging in industries comprised of some well established firms with sound assets, and other newer, more fragile firm. The follower firms, being less resilient to business shocks, may hence adopt a follower role in the market, awaiting for the more established leader firms to stabilize before making decisions on their own production levels. Undoubtedly, obtained equilibrium solution is a fixed point of the dynamic process in which the leader-and follower-firms readjust output levels according to the strategic market assumptions. Farsightedness of the leader works properly to make the proposal of agreement to reduce the production and maximize the gain from social welfare or from the consumers' surplus in long run.

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Successful Marketing
Get Brilliant Results Fast
By

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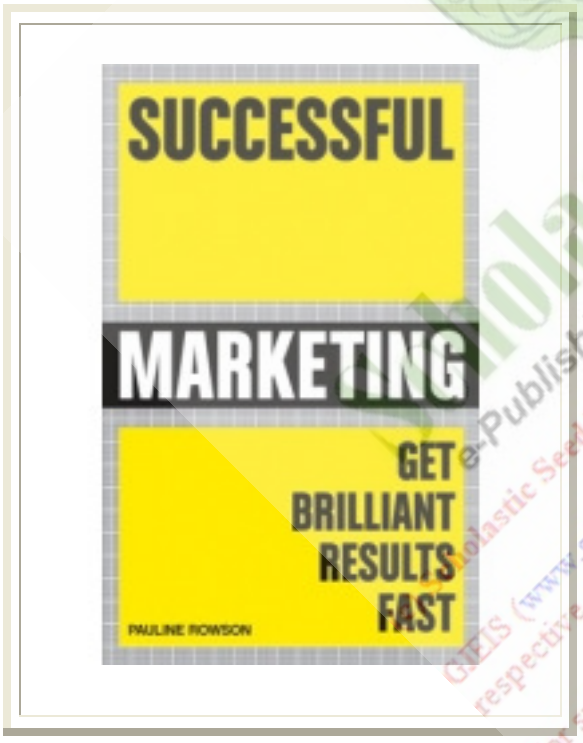
ABSTRACT

Successful Marketing is a step- by step guide to learn effective marketing techniques quickly and easily to win more business. This book will help one develop a marketing plan and has a good range of practical advice and ideas that could help one realize one's business dreams fast.



KEYWORD

Marketing	Customers
Pricing	Advertising
Branding	Viral Marketing
Competitive Edge	Media Profile

The book is divided into two parts. Part 1 which comprises 7 chapters gives an Introduction to Marketing.

All businesses have one thing in common: CUSTOMERS. Since without customers there is no business, it becomes important to understand who your customers are, what they want, when and how they want it. This makes it imperative to understand marketing and how it anticipates the wants of customers and ensures delivering the same.

Once you know the answers to these, then you can start to develop products and services that will sell, and look at how you price these to gain a competitive edge. Organizations need to constantly develop new products and services to suit the requirements of existing customers and new customers.

It is only at this point you can decide on a marketing strategy.

Having gained a clear direction of where you are heading and who you are targeting, you need the right marketing or promotional tools to reach those target customers.

Part II of this book comprising 12 chapters talks about various marketing tools and techniques such as advertising, Email marketing, newsletters, e- newsletters, corporate brochures, blogs, exhibitions, sponsorship and sales promotion more effective to boost results.

It discusses the pros and cons of each approach, advice on how to build successful list and making the content appealing and doing the ultimate job of creating new customers and business.

The book very succinctly explains that all the marketing activities one does, they require a constant reviewing whether a response is generated through them or not.

If a response is not generated from a certain type of marketing then it implies that message is not reaching the people you want it to and something else needs to be tried.

The book has helpful action points, tips and summaries and the end of each chapter for easy references. It is packed with helpful examples and practical exercises to complete. It's a well –written and informative read.

Global Journal of Enterprise Information System

Integrated Marketing Communication

CREATIVE STRATEGY FROM IDEA TO IMPLEMENTATION

By

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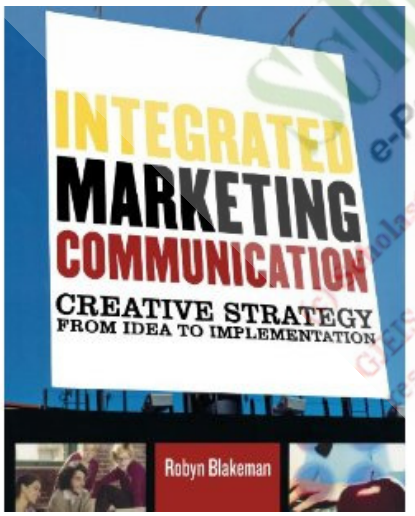

ABSTRACT

Integrated Marketing Communication (IMC) attempts to enhance the understanding as to how to tie the business of advertising to the creative of advertising. The book succinctly brings out that advertising creative process is not an art but a marketing function. The book explores the power of brand and the role of IMC in building Brand Equity.

KEYWORD

Internet	Creatives
Advertising	Marketing Plan
Branding	Promotional Mix

The text is highly relevant and useful to business professionals. It can be of great help to students pursuing marketing course in advertising.

The book features a highly modular structure comprising a total of 15 chapters with an attempt to highlight how to interpret a business plan to create an idea and how IMC uses a strategic approach to build and sustain brand to target relationships using a coordinated message in diverse media.

The main goal of advertising is revenue generation through entertainment plus information. To achieve this, creative terms must build an interpretive creative strategy based on a sound business plan.

In chapter I, the author defines the subject matter of IMC, why it fails, reasons for its growth and difference between traditional advertising method and IMC.

Chapter 2 throws light on role of Marketing plan, what it does Situation analysis or SWOT (Strengths, Weaknesses, Opportunities and Threats), Meaning of Marketing Mix and choosing of Target Audience i.e. Target Market analysis.

Chapter 3 defines a Brand, Its image and its worth. It corroborates the term positioning explaining ways to position a product or service is through originality, price, gender, age, time of day when product will be used and distribution channels.

In Chapters 4-6, the author highlights the importance of creative briefs as to how it provides a blueprint for creating an effective ad or campaign, How to make a creative strategy to gain a competitive edge. It explains the role of visual/verbal cues, Graphics and color's representational role in terms of its mood, meaning and emotion.

Chapter 7 brings forward the concept of copywriting and its components such as headlines, subheads, use of logo as a symbol. In subsequent chapters, terms such as campaign, Public Relations, Newspaper Advertising, Magazine advertising, Direct Marketing, sales promotion and Internet Marketing have been explained as to how they can be strategically used in IMC

The book provides several case studies, practical examples, templates and vibrant visual features which facilitate in development of skills in taking a creative idea and employing the correct message, placing it in the most appropriate media, and using the most effective communication approaches.

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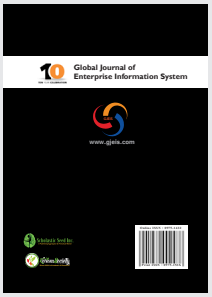

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Blockchain Federation of India [BFI]

Blockchain Federation of India is the primary and principal body of blockchain professionals in India. It was founded on 13th March 2019 by a few academician and Cyber professionals including its co-founders Col. Inderjit Singh Barara and Dr. Subodh Kesharwani which has now grown to be the national body representing blockchain professionals on a PAN India basis, in fact informally through social networking cites group exists from 2017 onwards. BFI is a non-profit professional meet to exchange views and information learns and share ideas. The wide spectrum of members is committed to the advancement of theory and practice of Blockchain and Technology Systems, Science and Engineering, Information Processing and related Arts and Sciences. The Federation also encourages and assists professionals to preserve truthfulness and aptitude of the profession and fosters a sagacity of partnership amongst members. Besides formulating the activities held at the chapters and student branches, the society will also conducts periodic conferences, seminars. The society will be in touch with various International bodies of blockchain for an international alliance.

BYLAWS OF BLOCKCHAIN FEDERATION OF INDIA

Blockchain Federation of India known for its acronym (BFI) is an Indian customized international organisation dedicated to raising digital competence standards in the workforce, education and society in blockchain perspectives. BFI have a certain vision and mission:

- To bring all block chain researcher and technocrats under one roof
- Formulation of Block chain Virtual university
- Developed Own Teaching Contents in Block chain

BLOCKCHAIN VIRTUAL UNIVERSITY

Blockchain Federation of India is an international organisation dedicated to raising digital competence standards in the workforce, education and society vis-à-vis blockchain. Our proposed certification programmes, delivered through an active network in multiple countries, enable individuals and organisations to assess, build and certify their competence in the use of blockchain tools to the globally recognized BFI standard, known as BFI worldwide. As a nonprofit social enterprise Blockchain Federation of India (BFI) benefits from the exclusive support of experts from national technical societies and partners international to enlarge vendor-independent standards which define the skills and knowledge required to use blockchain technology in actual fact. We work with education and training partners, local and regional authorities, national governments, international development organisations as well as public and private sector employers in all sectors, in the delivery of our programmes. The quality and reputation of BFI is built on years of expertise earned by it's founders and associated office bearers. Our accomplishment is maintained by our forthcoming innovation in certification programme development, our commitment to rigorous test design methodologies, and consistent adherence to our quality assurance standards. Blockchain Federation of India planning to support the initiatives of National Operators of the programme in various parts of world. All Blockchain Federation of India operations work closely with regional, national and local partners to develop the global network of BFI Accredited Test Centers.

BYLAWS OF THE BLOCKCHAIN FEDERATION OF INDIA

ARTICLE I. NAME

- The name of the Federation shall be the "Blockchain Federation of India", and it shall be incorporated as a nonprofit corporation in Republic of India with a Headquarter in New Delhi.

ARTICLE II. PURPOSE

- The purpose of the Federation shall be to promote Blockchain education through faculty development and to encourage that the teaching and learning \ related to blockchain implementation in various upcoming field.

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ARTICLE IV. MEMBERSHIP

- Section 1. The Board may establish and/or change the membership classes. The Board of Directors shall set the dues amount and the criteria for each class of membership.
- Section 2. All individuals who are members in good standing shall have the right to vote, hold office, and serve on committees. To be in good standing, a member must not be more than six months in arrears in his/her dues and financial obligations to the Federation. Individuals more than six months in arrears in their dues will be declared inactive, but retained on the membership rolls for an additional six months. Inactive members can reinstate their good standing by payment of current and all past dues.
- Section 3. Individuals whose dues are more than one year in arrears shall be dropped from the membership rolls.

ARTICLE V. OFFICERS

- Section 1. The Officers of the Federation shall be the President, President-Elect, Secretary, Treasurer, and the Immediate Past-President. The election procedure is as described in Article VII.
- Section 2. President & Secretary. The President and Secretary of BFI is the highest ranking officer of the Federation and are directly accountable to the membership and the Board. The President leads the Board of Directors as a chairperson and Secretary will be the Convener in development of the strategic goals and objectives of the organization and provides direction and leadership. The President serves as the Chair of the Board of Directors, Executive Committee and Annual General Meetings. A detailed position description, approved by the Board, shall be maintained on the Federation's website.
- Section 3. Immediate Past-President. In those years when a new President is elected, the current President assumes the office of Immediate Past-President. The Immediate Past-President remains in office until a new Immediate Past-President assumes the office. A vacancy in the office of Immediate Past-President cannot be filled by appointment. A detailed position description, approved by the Board, shall be maintained on the Federation's website.
- Section 4. President-Elect. The President-Elect is the third highest ranking officer of the Federation and shall support the President and secretary to advance the work of the Federation. At the end of the term, the President-Elect shall assume the office as President of the Federation. In the event that the President is temporarily unable to fulfill her/his duties to the Federation, the President-Elect may be appointed Acting President by the Board of Directors. If the President resigns or is unable to fulfill their duties for an extended period, the President-Elect shall become the President and a new President-Elect shall be elected by a majority vote in a special election of the Board of Directs within 30 days. A detailed position description, approved by the Board, shall be maintained on the Federation's website.
- Section 5. Secretary: The Secretary oversees the recording of proceedings of meetings of the Federation and the Board of Directors, and is responsible for the Federation's correspondence. A detailed position description, approved by the Board, shall be maintained on the Federation's website.
- Section 6. Treasurer: The Treasurer oversees the financial records of the Federation according to standard accounting practices, and, whether performed personally or through the Federation's administrative office, is responsible for safeguarding the Federation's funds. The Treasurer presents periodic reports on the financial status of the Federation to the Board of Directors and a full report to the membership at the Annual Federation Meeting. A detailed position description, approved by the Board, shall be maintained on the Federation's website.

ARTICLE VI. BOARD OF DIRECTORS

- Section 1. The Board of Directors shall be the principal governing body of the Federation. The Board of Directors shall consist of eleven (11) Directors plus four (4) Officers plus the Immediate Past-President,

if the Immediate Past-President is not an elected Director. When the Immediate Past-President is not an elected Director, the Immediate Past-President would be an ex-officio member of the Board of Directors and the Executive Committee until a new Immediate past President assumes the office. In that capacity, the Immediate Past-President has a vote only to prevent a tie (so when an even number of Directors and/or Officers is present).

- Section 2. Directors shall be elected for a three (3) year term. The terms shall be staggered and at least three (3) seats will be elected annually. Directors may not be elected to serve consecutive terms but may be reelected after an absence of one year. The election procedure for Directors is described in Article VII.
- Section 3. The Board shall meet quarterly, or more often if the need arises, at the call of the President or at least three members of the Board. Board meetings may be held in person, by teleconference, or other electronic means. A proposed agenda and supporting materials shall be made available to Board members prior to a Board meeting.
- Section 4. A quorum shall consist of one more than half the current number of Board members and must include at least two members of the Executive Committee.
- Section 5. In the event a vacancy occurs on the Board in a Director position, the President shall, with the approval of the Board, appoint a member to fill the vacancy. These appointed members shall serve out the term of the individuals they replace on the Board. The new Director shall complete the term of the former Director and shall be eligible for reelection if the remaining term is less than two years. Individuals joining the Board of Directors by appointment as a Director shall not serve more than three consecutive years in that office as a Director in addition to the partial term they served as replacement. In the event a vacancy occurs in an Officer position, the Board will immediately elect a new officer to that position in accordance with Article VII. The elected member takes office immediately, shall serve out the term of the individual she or he replaces as an Officer and will still be eligible for one complete term (of two years) in that same Officer position in addition to the partial term she or he served as a replacement.
- Section 6. With the approval of the Executive Committee, the President may recommend that any Board member be removed from office by the following procedure: 1) reasons for the proposed action must be provided in writing to the member, 2) the member shall have 60 days in which to represent themselves at a meeting of the Board, 3) a two-thirds vote of the current number of Board members shall then decide.

ARTICLE VII. NOMINATIONS AND ELECTIONS

- Section 1. Nominations. The Nominating Committee shall on or before January 25th submit to the Federation Manager a list of candidates for each position subject to election in that year. The names of these individuals, and other such supportive materials as deemed appropriate by the Nominating Committee, shall be posted to the Federation's website on or before February 1. The Federation's administrative office shall mail or fax a copy of these materials to those BFI members who have previously indicated they do not have Internet access. Between February 1 and February 15, members may petition for additional candidates to be added to the ballot. Such nomination petitions may consist of either a single document or separate letters. To be nominated by petition, each candidate must have the support of at least 15 BFI members in good standing. All petitions and letters must be addressed to and received by the Federation Manager on or before midnight (IST) of February 15.
- Section 2. Elections. On March 1, a secured, electronic ballot shall be activated on the Federation's website, along with instructions for electronic voting. All ballots must be electronically submitted to the website on or before midnight (IST) March 15 to be counted. Results shall be posted to the Federation's website by April 1. A plurality of the votes cast is needed for election. In the event of a tie, the election shall be decided prior to April 1 by a majority vote of the current number of Board members.
- Section 3. Newly elected Directors will assume their office at the conclusion of the Federation's annual meeting.
- Section 4. The Officers (of the Federation President, President-Elect, Secretary and Treasurer) shall be elected by a majority vote of the Board of Directors by electronic vote before December 15th, and assume their duties on January 1st. If the elected Officer is a current Director, the newly elected Officer must resign as a Director before assuming the role as an Officer. Officers serve a two-year term of office, and may not serve consecutive terms. However, they may be reelected to the same office after an absence of one year. An Officer may be elected to a different position on the Executive Committee immediately following his/her current term. There is no limit on the number of times an individual may serve as an Officer. The President-Elect, Treasure, and Secretary shall be elected by the Board of Directors as described in Section 5 below. Officers may be removed by a two-thirds vote of the entire membership of the Board of Directors.
- Section 5. Nominations for Officers. In the year the Officers are to be elected, a special Officer Nominating Committee will be formed, composed of the Immediate Past-President, President-Elect, two members from the BFI Nominating Committee (elected by the Nomination Committee) and one current Director

(elected by the Board of Directors). No committee member can be a concurrent candidate for an Officer position. The special Officer Nominating Committee shall on or before November 1st submit to the Federation Manager a list of candidates for each Officer position. Candidates must be BFI members in good standing. The names of these individuals, and other such supportive materials as deemed appropriate by the Nominating Committee, shall be posted to the password protected Board website on or before November 7th.

- Section 6. If a conflict arises concerning elections of Directors or Officers, the current Chair of the BFI Nominating Committee and 2 recent Past Presidents will be appointed to resolve any conflicts.

ARTICLE VIII. STANDING COMMITTEES

- Section 1. Membership and Term of Service. Standing Committees are defined in these Bylaws of BFI and can only be removed or redefined by majority vote of the membership. Other committees may be created by the Board to serve specific duties important to the organization
  - Chairs of Standing Committees, except the Executive Committee, are nominated by the President and approved by the Board. They serve three-year terms until the close of the next Annual Business Meeting and may be reappointed.
  - Members of Standing Committees, except the Executive Committee, the Professional Development Committee and the Nominating Committee, are appointed by the committee Chair, who will notify the Board of all committee membership changes. All appointed members shall serve one-year terms until the close of the next Annual Business Meeting and may be reappointed.
- Section 2. Executive Committee. The Executive Committee, which consists of the Officers, shall make decisions and take actions on behalf of the Board in between Board meetings. The President shall call meetings of the Executive Committee.
- Section 3. Nominating Committee. The Nominating Committee shall be responsible for determining a suitable group of candidates for election to the Board of Directors. It shall consist of five members who are neither current members of the Board nor current Committee Chairs. They may not be current candidates for the BFI Board. The President shall appoint a Chair plus two members with the approval of the Board of Directors. Two members shall be nominated and elected by the membership at the Annual General Meeting.
- Section 4. Professional Development Committee. The Professional Development Committee shall be responsible for recommending the overall scientific and educational programs of the Federation to the Board. Membership will include the current BFI President, President-Elect and Chairs of the Publications Committee and of other Committees with missions relevant to professional development activities, as determined by the Board.
- Section 5. Publications Committee. The Publications Committee shall be responsible for oversight and management of all publications of the Federation. They will work in concert with the Editorial Board of the Federation's journal.
- Section 6. Membership Committee. The Membership Committee shall be responsible for evaluating the needs of the membership and recommending appropriate ways to meet those needs. The committee will develop methods and programs for active membership recruitment and retention.
- Section 7. Finance and Organizational Development Committee. The Finance and Organizational Development Committee shall assist the Treasurer, who shall serve as Committee Chair, in maintaining the financial health of the Federation, including preparation of the annual budget. It will also be responsible for pursuing appropriate federal, foundation, corporate, and private funding to support the work of the Federation. The Committee shall be chaired by the Treasurer.

ARTICLE IX. MEMBERSHIP MEETINGS

- Section 1. Annual General Meeting Time, Place, and Purpose. The Annual General Meeting of the Federation shall be held at such time and place as may be selected by the Board of Directors and stated in the Notice of Meeting. The Annual General Meeting shall include the transaction of such other business as may properly be brought before the membership.
- Section 2. Notice of Meetings. The Federation Manager shall give notice of all Federation meetings stating the place, day, and hour of the meeting and, in case of a Special Meeting, the purpose for which the meeting is called. Such notice of special meetings shall be not less than ten or more than fifty days before the date of the meeting. Notice of the Annual General Meeting is to be given no later than the prior Annual General Meeting.
- Section 3. Quorum. A quorum for transaction of business shall be not less than 10% of the total membership in good standing.
- Section 4. Voting and Representation. Each member who is present shall be entitled to one vote at all BFI meetings. A membership roll showing the list of members as of the record date, certified by BFI's Secretary, shall be produced at any meeting of the members upon request. All persons appearing on such membership roll shall be entitled to vote.

ARTICLE X. AMENDMENTS

- Section 1. Amendments of the bylaws may be proposed by a majority of the Board of Directors or by a petition, sent to the Secretary, bearing the signatures of at least 15 members in good standing.
- Section 2. Notice of proposed amendments, shall be posted to the Federation's website on or before March 1. The Federation's administrative office shall mail or fax a copy of these materials and the slate of nominees, described in Article VII, Section 1, to those BFI members who have previously indicated they do not have Internet access. On April 1, a secured, electronic ballot shall be activated on the Federation's website, along with instructions for electronic voting. The Federation's administrative office will mail or fax a ballot containing the proposed changes and the slate of candidates, described in Article VII, Section 2, to those BFI members who have previously indicated they do not have Internet access. All ballots must be electronically submitted to the website or received in the post by the Secretary on or before midnight (IST) of April 30 to be counted. The Secretary shall tally the votes and send the results to the Federation Manager for posting on the Federation's website by May 15.
- Section 3. In the event of an urgent requirement for an amendment, the Board of Directors, by a two-thirds vote, may authorize posting a proposed amendment to the members at any time. Notice of proposed amendments shall be posted on the Federation website for a 30-day period prior to balloting. At the end of the posting period, a secured electronic ballot shall be activated on the Federation's website, along with instructions for electronic voting. The Federation's administrative office shall mail or fax appropriate information and a ballot to those BFI members who have previously indicated they do not have Internet access. All ballots must be electronically submitted to the website or received in the post by the Secretary within 30 days of the opening of balloting. The Secretary shall tally the votes and send the results to the Federation Manager for posting on the Federation's website.
- Section 4. All amendments of the bylaws require an affirmative vote of two-thirds of the members in good standing who submit valid ballots.

ARTICLE XI. INDEMNIFICATION

The Federation shall defend and indemnify any qualified person against any threatened, pending, or completed legal action resulting from actions taken in good faith on behalf of the Federation. Qualified persons shall be present and former officers, employees, and officially elected or appointed members of boards, councils, committees, and other components of the Federation.

Indemnification will not be provided to any person who shall be adjudged in a legal action to be liable for negligence or willful misconduct in the performance of duty, or when such person did not reasonably believe that the action was within the law and in the best interests of the Federation.

Indemnification shall cover cost of defense and any judgments, fines, and amounts paid in settlement actually and reasonably incurred by a qualified person, up to a limit of one-million dollars in any single case except in circumstances expressly prohibiting such limitation under the law. Such indemnification shall be in accordance with the established policy of the Federation.

ARTICLE XII. OTHER PROVISIONS

- Section 1. The fiscal year of the Federation shall be on a calendar year basis (1st April to 31st March).
- Section 2. The Federation shall be governed Income tax rules of Order, as currently revised. In case of a conflict between Rules of Order and these bylaws, the bylaws shall take precedence.

ARTICLE XIII. DISSOLUTION OF THE FEDERATION

In the event of the dissolution of the Federation, the Board shall give all its assets to one or more nonprofit, tax-exempt organizations. If the Board cannot decide, the decision shall be made by the applicable Court in the Union territory of Delhi, India

ARTICLE XIII: MODE OF OPERATION & SIGNING AUTHORITY

Founder President and Secretary will be the whole time signing authority and operates banking transaction physically & virtually jointly

Col. Inderjit Singh Barara
President

Dr. Subodh Kesharwani
Secretary

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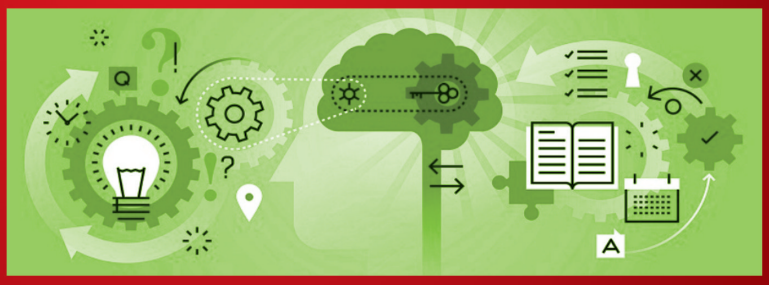

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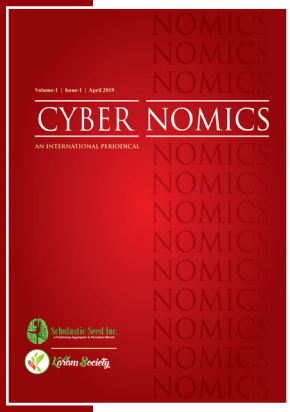

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