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Socio-Technical Factors Affecting ERP Implementation Success in Pakistan: an Empirical Study

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Abstract: An Enterprise Resource Planning (ERP) system automates and integrates key business processes of an organization and provides information to the top management required for strategic decision making. The implementation of ERP systems in organizations is a challenging task. Apart from the technical factors associated with ERP implementation, various socio-technical factors are found critical during ERP implementation. This research is focused on exploring the most critical factors, either technical or socio-technical, which may contribute towards successful ERP implementation in organizations. Research findings are based on survey research conducted in public and private organizations in Pakistan. Before conducting the final survey, a survey instrument was validated using a pilot study. A sample for the pilot survey was selected using a random sample of 8 organizations. Initially, 24 factors were taken. However, after doing factor analysis only 14 factors were included in the final survey. For the final survey, questionnaires were sent to 202 Managers/Project Directors in organizations where ERP systems had already been implemented or the implementation of ERP was in a final stage. In response, 116 useable questionnaires were received with a response rate of 57.42%. The research findings showed that professional manpower, project scope definition, business process re-engineering, top management support and change management are the top most critical factors in an ERP implementation. The findings may be of interest for practitioners and a valuable contribution to the existing body of knowledge of ERP implementation.

Key words: Enterprise Resource Planning (ERP) Systems, Critical Success Factors, ERP Implementation Success, Quantitative Research.

INTRODUCTION

The implementation of ERP system is defined as "the process of developing the initial business case and planning the project, configuring and implementing the packaged software, and subsequent improvements to business processes" (Parr, 2000; Francoise, 2009). Enterprise Resource Planning utilizes ERP software applications to improve the performance of organizations resource planning, management control and operational control (Zhang, 2002). ERP systems integrate diverse business workflows, improve organizational coordination, efficiency, decision making and changing dimensions of business such as firm structure and business, share data across the entire enterprise to produce timely information (Law, 2007; Syed Iftikhar, 2008). Such systems are not built but adopted and may cause major changes to the existing work flows on implementation. The implementation of ERP systems usually requires organizational work processes to adopt best business practices for smooth running of the business processes in the organizations. The organization those have adopted ERP systems reported both encouraging and disappointing outcomes (Lindley, 2008). Various challenges have been faced by organizations in implementation of ERP solutions leading to failures (Thavapragasam, 2003).

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There exists different stories regarding success and failures of ERP implementation (Thavapragasam, 2003; Zhang, 2002) mentioned that 75% of the ERP systems are failed (Parr, 2000) said that many ERP systems implementation were not completed on time, and within budget. The past studies reflect that failure percentage of ERP systems is ranging from 40% to 90%(Parr, 2000; Thavapragasam, 2003). It is evident in the past research that 90% of ERP systems implementation was found behind schedule or over budget whereas the success rate is approximately 33% (Holland, 1999; Fitz-Gerald, 2004) mentioned that a survey of 117 companies involved in ERP implementation lead to the finding that 25% ERP projects were over budget, 20% were terminated before implementation and 40% of the respondents confirmed that ERP projects' failed to achieve business objectives. (Singh, 2009) discussed various causes of system failures which are related to technical, organizational and behavioral problems. The higher failure rate of ERP implementation invites researcher's attention to better understand the success factors that may contribute towards successful implementation of ERP systems in organizations (Somers, 2001; Singh, 2009; Syed Iftikhar, 2008).
Our research is aimed to provide answers to the following research questions.
Q1. What are the common success factors in the implementation of ERP systems in Pakistan?
Q2.What are the top most critical factors of successful ERP systems implementation in Pakistan?

II. Literature Review:

II-A. Enterprise Resource Planning (ERP):

Researchers define ERP system as configurable Information Systems packages that integrate information and information based processes with and cross functional areas in an organization (Kumar, 2000). ERP systems require large investments in terms of money and time, and change in business processes for smooth flow of information. The organizations are investing heavily in ERP systems and the claimed benefits from such financial and human resources are in three major areas such as accurate and timely information for strategic decision making, business process improvement and client focus (Fitz-Gerald, 2004).

Before implementation of ERP systems in organizations, the existing information stored in different Information Systems within different functional areas of an organization is require to be integrated and available to the organization as a whole. This goal may be achieved through successful ERP system implementation. There is no doubt that implementation of ERP system is a challenging task and it may take two to five years to implement ERP solution in organizations successfully (Laudon, 2002). ERP systems are comprehensive, fully integrated and support common, global business process (Markus, 2000) argues ERP systems as more than a software package suggesting that it represents a specific paradigm.

The popularity of ERP systems is also evident from its sales exceeding $30 billion in 2002, an increase of 300% since late 1990s. More than 60% of US companies have implemented or planned to implement ERP systems (Magnusson, 2004). ERP systems are growing day by day and are becoming backbone of the organizations. Researchers said that ERP is the heart of an Information System and plays an important role by virtue of its extra ordinary features. But the potential benefits of Enterprise wide systems such as MRP (during 1970's), MRP-II (during 1980's) and ultimately ERP (1990's) may only be achieved, through the successful implementation (Markus, 2000). Different past research studies attempted to explain success or failure of ERP systems in organizations (Magnusson, 2004; Syed Iftikhar, 2008). The successful implementation of ERP systems is questionable.

Why is implementation of ERP system problematic? The past research proved various reasons which are mentioned below.

- Need to change existing business processes during implementation of an ERP systems (Wood, 2010; Zhang, 2002; Singh, 2009).
- Lack of user involvement, top management support (Huang, 2010; Vineets, 2006; Wallace, 2004).
- Lack of education and user training (Zhang, 2002; Bhatti, 2005).
- User résistance (Zhang, 2002; Bhatti, 2005; Lindley, 2008).
- Poor selection of ERP system and vendors (Bhatti, 2005; Syed Iftikhar, 2008).
- Lack of data accuracy (Vineets, 2006).
- Lack of interest in managing cultural issues (Motwani, 2005).
- Unrealistic expectations and customization (Zhang, 2002; Syed Iftikhar, 2008).
- Lack of organizational commitment that ultimately slows down the implementation process (Zhang, 2002).
- Poor cost estimation and scheduling leading to over budgeting and delayed implementation of ERP. (Lindley, 2008;Francoise, 2009; Holland,1999; Parr, 2000).

Social and technical problems concerning implementing of ERP systems have been widely cited in the literature (Ramayah, 2007). Both technical and non-technical i.e. (social aspects of people and society) and (technical aspects of software and technology) issues are the common causes of failure that are needed to be addressed.

Researchers indicated that there exists a lack of research about the characteristics of the problems that ERP systems may face during its implementation (Ramayah, 2007). Despite heavy investment, the ERP systems implementations within budget, time and up to user's satisfaction are doubtful and invites researchers to look into the matter. It is important to examine the basic reasons which may impede the successful ERP implementation. The implementation of ERP system is a complex and costly activity (Magnusson, 2004; Markus, 2000). There is a need to study in depth, the factors affecting ERP Success in order to improve chances of successful ERP implementation. The "Factors which are significant contributors to success or failure" of ERP system are Critical Success Factors. Critical Success Factors (CSF) are the scenarios that are needed to be fulfilled for ensuring success of a system (Poon, 2000).

II-B. Critical Success Factors and ERP Success:

ERP success is evaluated in terms of technical, economic, financial or strategic business and smooth running of business operations, adoption by managers and customer's organizations (Markus, 2007). Various factors critical towards ERP implementation success were reported in several studies, however these studies had been carried out in developed and developing countries.

The frequency of each CSF cited in the literature is mentioned below in Table 1.

The next section further explains CSFs as under:

B1. Top Management Support:

The Management support means support in ethics, moral, finance and resource allocation to achieve the project/organizational objectives in time. The commitment and support from top management is critical towards success of ERP implementation (Kumar, 2000; Rasmy, 2005; Bhatti, 2005).

B2. Business Process Reengineering (BPR):

The implementation of ERP systems demand that the existing business processes may be changed to adopt best practices incorporated in the ERP software. Researchers defined Business Process Re-engineering (BPR) as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements is critical, contemporary measures of performance such as cost, quality, service and speed" (Hammer, 2001). The existing business processes in an organization should be aligned in accordance with ERP software to be implemented, and it is considered critical (Subramoniam, 2009).

B3. Organizational Culture:

The implementation of ERP systems always demand change in business process and organization culture. The culture of an organization is defined as "a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein, 1992). The culture of an organization concerns organization workflows, employees personal values, skills, attitude and decision making processes. Organizational culture plays an important role during implementation of ERP systems and consequently its success (Thavapragasam, 2003; Zhang, 2002).

B4. User Training:

The purpose of the training is to provide basic concepts and features of ERP system to the users and how its use may benefit the organization through automation of business processes. The main objective of ERP training is that the users should understand the various business processes behind the ERP application (Al-Mashari, 2006; Zhang, 2002). ERP implementation may fail due to lack of proper user training. Researchers found that lack of user training led to difficulties in MRP systems implementation (Bhatti, 2005).

B5. User Involvement:

Researchers defined user involvement as "A psychological state of the individual, and as the importance and personal relevance of a system to a user" (Hartwick, 2001). Users play an important role in the ERP System implementation (Francoise, 2009; Zhang, 2002). User involvement in defining ERP systems needs and user involvement in the implementation of ERP systems are important aspects (Rasmy, 2005). The user involvement in ERP systems will be helpful to get user requirements, better quality of the system and increase system usage (Esteves, 2003).

B6. Effective Communication:

The past research findings show that communication among stakeholders is a critical success factor for implementing ERP systems. The communication should start early in the ERP system implementation. It helps in understanding the purpose and reason for implementing the system. Effective communication is critical for ERP implementation (Esteves, 2003).

B7. Change Management:

Change management is critical for successful ERP system implementation. It also considered as main obstacles for successful ERP implementation (Wood, 2010; Kumar, 2000). The organizations are facing resistance to change as a major issue during implementation of ERP system which creates conflicts among stakeholders (Kumar, 2000).

B8. Vendor Support:

The implementation process may be supported by some factors external to the organization such as vendors' support. Organizations should optimize the vendor support that best serves the implementation process (Rasmy, 2005). In vendor selection process, vendor support and the number of previous successful implementation must be taken into account. Researchers identified that the risks of ERP project failures may be contained by acquiring external expertise through vendors and consultants (Roberts, 1992).

B9. Project Definition and Scope:

The organization must carefully define why the ERP system is being implemented and what critical business needs the system will address. It is important to set the objectives and goals prior to ERP systems implementation. There must also be clear definitions of goals and expectations. Clear goals and objectives are essential to guide an ongoing organizational effort for ERP implementation.

B10. Championship/Leadership/Team lead:

The past research findings support that the role of a champion and team lead is most critical for successful ERP implementation. A business leader should be in charge of the project and the project leader should "champion" the project throughout the organization (Parr, 2000).

B11. Professional Manpower/ERP Team:

ERP implementation team may comprise functional personnel and management, IT personnel and management, top management, IT consultants, ERP vendor, parent company employees, management consultants, and hardware vendor. ERP team should consist of the best people for successful implementation of ERP system in the organization (Roberts, 1992).

B12. Software Configuration:

The configuration of the Software concerns adoption of the generic functionality of a package to the needs of a particular organization (Markus, 2000). Software Configuration plays an important role in the success of ERP system implementation. The ERP packages may be configured to closely fit an enterprise's business processes (Holland, 1999).

B13. Users' Acceptance:

User acceptance of a system was a well accepted surrogate measure of IS success in the past research. User acceptance and adoption of Information System is a critical factor for successful EPP system implementation (Kakumanu, 2005). User acceptance is a key factor of ERP system implementation (Singh, 2009; Woo, 2007) and consequently, its success (Vichita Vathanophas, 2007). The organization should adopt an implementation process that may lead to user acceptance (Magnusson, 2004).

III. Research Methodology:

At the outset of planning a piece of research work, the most important decision on the part of a researcher is to choose appropriate research method(s) or approaches that best suite the research question or idea that he/she is likely to address. (Flower, 1998; Yin, 2009). If the phenomena under study can be measured in some way then a quantitative study seems to be more appropriate (Flower, 1998; Yin, 2009). Keeping in view the research questions, survey based research has been chosen as a research strategy.

The sample for the pilot survey was selected using a random sample of 8 organizations. A questionnaire was developed based on 24 potential factors reviewed in the literature regarding ERP implementation success.

To collect individuals' opinions about their agreement or disagreement, a five-point Likert-type scale ranging from 1 (Definitely Disagree) to 5 (Definitely agree) is used (table 2). The advantages of Likert-Type scale is easy to use and gives precise results (Kosecoff, 1998).

IV. Data Collection and Analysis:

An attempt has been made to approach managers in various organizations in Pakistan which have implemented or in the process of implementing ERP systems. We did a pilot survey and 75 questionnaires were sent to managers. However, 55 useable questionnaires were received. The response rate was 73%. Reliability Analysis, Content Validity and Construct Validity Analysis were carried out. The sample for the pilot survey was selected using random sampling from the selected 8 organizations. After doing Factor Analysis 10 items were discarded from instrument for which Cronbach Alpha was observed less than 0.70 as recommended (George, 1995; Kim, 1978). After validating the questionnaire were sent to 202 managers of different organizations (public and private sectors) through mail. The respondents were senior project managers, project manager, BPR specialist, master trainers, production inventory manager, material handling manager, and production manager. Only 116 useable questionnaires were included in the data analysis. The response rate was 57%.

The Critical Success Factors were ranked by calculating means of the responses collected as shown below in Table 3.

Table 1: The frequency of 24 CSFs cited in the literature.

Critical Success Factor (CSF)	No. of instances cited in literature	Critical Success Factor (CSF)	No. of instances cited in literature
Top Management Support	30	Legacy system	06
Business Process Reengineering	16	Schedule of deliverable	07
Organizational Culture	12	Minimal customization	03
User Training	23	Experience Consultants	08
User Involvement	17	Monitoring & feedback	03
Effective Communication	16	Risk Management	04
Change Management	20	User Acceptances	10
Vendor Support	10	ERP Implementation Strategy	06
Project Scope and definition	14	Software Configuration	10
Leadership	13	Suitable IT Infrastructure	10
Data Accuracy	04	Selection of ERP	11
Professional Main Power	19	Firm IT Maturity	02

Table 2: Five-point Likert-type scale ranging from 1 (Definitely Disagree) to 5 (Definitely agree).

Scale Number	Category	Scale Number	Category
5	Definitely agree	2	Mostly disagree
4	Mostly agree	1	Definitely Disagree
3	Neither agree or disagree		

Table 3: List of top 14 CSFs with mean value found in our Research.

CSF	Mean	CSF	Mean
Professional Man Power	4.55	User Involvement	4.44
Project Scope Definition	4.53	Selection of ERP Package	4.43
Business Process Re Engineering	4.49	Effective Communication	4.42
Top Management Support	4.48	User Training	4.40
Change Management	4.47	Software Configuration	4.38
User Acceptance	4.46	Vender Support	4.37
Organizational Culture	4.45	Role of Team Lead	4.36

V. Research Findings and Discussion:

Most of the studies regarding ERP implementation success factors have been conducted in developed countries. There exist fewer examples of research studies on critical success factors concerning ERP systems implementation in developing countries like Pakistan. The major objective of this research was to improve the understanding of critical factors affecting ERP implementation success in Pakistan. Research findings may contribute towards organizations, users, management and system developers to learn about various issues relating to ERP implementation success. This research will thus add to the growing body of knowledge on ERP implementations.

The findings of our research study reflect Professional Manpower, Project Scope Definition, Business Process Re-Engineering, Top Management, Change Management, User Acceptance and Organizational Culture as the most critical success factors for ERP implementation in Pakistan.

The professional manpower with a mean value of 4.55 was found to be the top most CSF.

The project scope definition was found to be the second most critical factor having mean value 4.53. Our findings differ from past research which had pointed out top management support as the most critical success factor (Keil, 1998; Woo, 2007; Rasmy, 2005). Our research found top management support at 4th position among the 14 CSF which were considered. It may be due to the reason that most of past research was carried out in developed countries rather than developing countries.

As vendor support regarding ERP implementation is concerned, our research findings support that vendor support is one of the top ten most Critical Success Factor for ERP system implementation in Pakistan. The findings differ from a study carried out in Egypt in which it was found that vendor support has no effect on the ERP system implementation (Rasmy, 2005).

Our research findings reflect organization culture as one of the critical factor in ERP implementation. It falls at 7th position in ranking.. It is in compliance to the past research studies (Rasmy, 2005; (Thavapragasam, 2003). Change management, user involvement, professional man power were found most critical success factor for ERP system implementation in our research. Similar findings have been found in past research (Meissonier, 2006; Woo, 2007). Our research results showed project scope as critical success factors in ERP implementation success. Similar findings have been found in a study conducted in Sweden and Australia (Svensson, 2006), (Woo, 2007). Thus such factors appeared to be important in both developed and developing countries. Researchers also mentioned top management support, user involvement, change in project scope and training as the most critical success factors for ERP system in their study conducted in Hong Kong, Finland and USA (Keil, 1998). Such factors were found critical in our research as well. Project scope, professional manpower, role of champion, user involvement, consultant, strong communication, user training which appeared critical in our study were in match with factors that had been found critical in another study conducted in New Zeeland. It was concluded that role of champion/CIO is the most critical for successful ERP system implementation. According to our research finding role of champion/CIO is a critical factor but falls at the bottom of the list comprising of fourteen factors. Moreover, user acceptance was also found as critical factor in our study.

VI. Conclusion and Future Research:

Initially 24 factors were collected from the various past research studies. None of the researcher had taken all these factors for a study. Our research included 24 factors to be studied for its ranking and contribution in ERP implementation success. In our pilot survey 24 factors were included in the questionnaire, however only 14 factors were found having Cronbach Alpha value equal or greater than 0.70. Therefore these 14 factors were included in our final survey. The ranking of the factors considered was found a bit different from the past research findings. The top most five factors found to be critical were professional manpower, project scope definition, business process re-engineering, top management support and change management. Our research found professional manpower as the top most critical factor whereas different past studies showed top management as a top most factor. It is speculated that the professional manpower in countries like Pakistan may have less awareness and practical exposure of ERP system implementation. So the organizations may not ignore this factor during the implementation of ERP.

Future work will consist of how these success factors are critical in ERP Implementation among various sectors such manufacturing, telecommunication etc. This will help in determining how the ranking of such factors may vary among different sectors. The various factors which are found to be critical in our research may be studied in other organizations using Case Study Method. This might help to explain in depth the phenomena under research.

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