A Qualitative Study of the Critical Success Factors of ERP System - A Case Study Approach

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Abstract

The aim of the present study was to explore Critical Success Factors (CSFs) in implementation, pre-implementation and post-implementation phases of ERP system. A single exploratory case study approach has been employed to analyze the case of an electric supply Government owned company of Pakistan. For the collection of data face-to-face in-depth interviews were conducted. NVivo 10 software has been used for the in-depth qualitative analysis. Many techniques have been used for the validation of different themes of the study such as Coding Nodes, Word Tree, Word Tag Clouds and Tree Map. This study found six CSFs of ERP in pre-implementation phase, twelve CSFs during the phase of ERP implementation and six CSFs in pre-implementation stage. This study also gives general recommendations for ERP consultants and ERP end-user companies for the successful implementation of ERP system.

Keywords
ERP system, Critical Success Factors (CSFs), Case Study, Phases of ERP implementation

Introduction
Enterprise Resource Planning (ERP) system is one of the very complex information systems for the organization (Umble & Umble, 2003). It integrates all departments with the organization and automates all processes. ERP system implementation is a big challenge for every organization. Different factors influence positively or negatively on the successfulness in implementation of ERP system. These factors are known as critical factors. Critical success factors (CSFs) become the reasons of successful implementation of ERP system. Pinto and Slevin (1987, p.22) defined CSFs as "factors which, if addressed, significantly improve project implementation

chances". Rockart (1979, p.85) defined CSF as "the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization".

The present study aims to identify CSF in different phases of ERP system implementation. This study has different sections: first section discusses the introduction, second section describes the review of literature, third section explains research problem along with research objectives of the study, fourth section shows conceptual framework, fifth portion describes research methodology, sixth section shows the findings of the study and it the last section conclusion and recommendations have been discussed.

Review of Literature

Martin (1998) stated that most of the ERP implementations are over budget or late in completion. Another author stated: "an effective IT infrastructure can support a business vision and strategy; a poor, decentralized one can break a company. More and more companies are turning to off the-shelf ERP solutions for IT planning and legacy systems management" (Holland & Light (1999, p.1). Nielsen (2002) investigated Austrian Universities to find different CSFs of ERP project. Using the case study approach Nielsen confirmed 22 different CSFs and explored four new CSFs of ERP system such as service for students, competitive edge, system ownership and knowledge management. Figure 1 shows ERP implementation process model by Holland & Light (1999) where they categorized CSFs of ERP system implemenation into two categories: strategic and tactical.
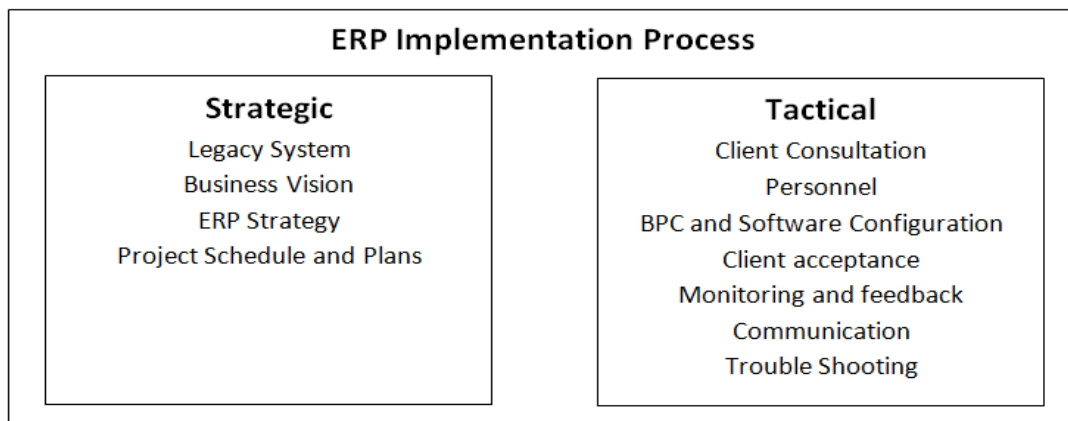
ERP Implementation Process

Strategic	Tactical
Legacy System	Client Consultation
Business Vision	Personnel
ERP Strategy	BPC and Software Configuration
Project Schedule and Plans	Client acceptance
	Monitoring and feedback
	Communication
	Trouble Shooting

Figure 1 Adapted from Holland & Light (1999)

Umble & Umble (2003) identified different CSFs of ERP project such as commitment by top management, understanding of strategic goals, data accuracy, managing change, education & training and implementation team. Sun et al. (2005) also identified different CSFs that influence the cost, schedule and goal achievement of an ERP Project. They found that people are very critical in successful implementation of ERP system. Different studies used case study and field survey methods to idenfify differnet cricial success factors of ERP implemnation (Yingjie, 2005; Finney & Corbett, 2007; Plant & Willcocks, 2007; He, 2007; Nattawee & Siriluck 2008; Ngai et al., 2008; Tan et al., 2009; Fang & Patrecia, 2009; Moohebat et al., 2010; Ganesh & Mehta, 2010; Pabedinskaite, 2010) whereas Garg (2010) Pareto Analysis of existing literature and Upadhyay et al. (2010) compared CSFs and their significance in developed and developing countries whereas, Maldonado (2009) investigated the relation of different factors on the successful implementation of ERP system project.

THE RESEARCH PROBLEMS

Garg (2010) stated that companies do not show the failure of ERP system implementation however, ERP failure rate is very high. Different factors influence positively or negatively on the successful implementation of ERP system. Different studies identified these critical success and failure factors of ERP system implementation. CSFs become the reasons of successful implementation of ERP system. We can also say, that these factors positvely influence on the succesfulness of ERP implementation. The particular problem statement of the present study is:

> *"to find critical success factors (CSFs) in differnet phases of ERP system implementaiton in the context of Pakistan"*

RESEARCH OBJECTIVES

CSFs occur in all statege of ERP implemenation: pre-implemenation, implemantion and post-implemenation. However, few studies have addressed CSFs ERP system in different stages of implementation. The objectives of the study are:

1. To identify critical success factors in pre-implementation phase of ERP System
2. To identify critical success factors in the phase of implementation of ERP System
3. To identify critical success factors in post-implementation phase of ERP System
4. To explore significance of each critical success factor in different phases of ERP implementation
5. To give general recommendations to organizations and ERP consultants for the successful implementation of ERP system

CONCEPTUAL FRAMEWORK

Figure 2 shows the conceptual framework of the study where ERP system implementation has been divided into three stages: implementation, pre and post implementations. This three stage model also shows CSFs associated with the each phase. On the bases of this framework the present study identified different CSFs in these three stages of ERP implementation.

Figure 2: Conceptual Model of the Study

Three Stages of ERP System Implementation

Pre-implementation Stage of ERP system	Implementation Stage of ERP system	Post-implementation Stage of ERP system
Critical Success Factors	Critical Success Factors	Critical Success Factors
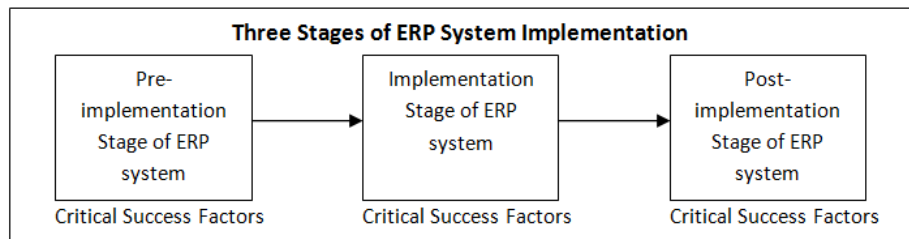
RESEARCH METHODOLOGY

This study employed case study approach guidelines of Yin (2009). Case study approach is a famous qualitative research strategy for the in-depth analysis of a case.

Background of the Case Study

A Government owned electric supply company in Pakistan has been selected where ERP system has been successfully implemented. The company is producing electrify supply to different industrial and domestic customers in a specific regions in Pakistan.

Data Collection

Fifteen face to face interviews of ER end users and consultants have been conducted (including six video recordings of 30-45 minutes. Different semi-structured and sometimes unstructured questions were asked to respondents.

A convenience sampling technique was used because of the nature of the study. Convenience sampling is the most appropriate method in qualitative research to dig out the realities after the in-depth analysis. ERP end users and some of the member of ERP consultant team participated for the interviews. These respondents were the permanent employees and contractual consultant of ERP system. Figure 3 shows Pie Chart of employment status of respondents: 20% from contractual consultant, 40% from middle level management, 20% from lower level management, and 20% from top level management.

Data Analysis Procedure

Case study strategy has been used for the in-depth analysis of the company where ERP system has been implemented. Using NVvio 10 software different techniques have been used for the qualitative data analysis such as coding & thematic analysis, word tag clouds, word tree and tree map. NVivo is strong and very helpful for qualitative data analysis (Ozkan, 2004). However, the methodology for applying different techniques using NVivo depends on the researchers who are applying different techniques.

Many techniques have been used for the validation of different themes of the study such as Coding Nodes, Word Tree, Word Tag Clouds and Tree Map. Data has been analyzed in different phases: first of all recorded data has been transcribed into textual form, then different themes have been identified from the textual data, after that all related textual data has been coded into different related themes. This study also used "word tree map" and "world tag clouds" for collecting more evidences for the strength and validity of different themes. After applying all these

techniques, the study also used "Tree Map" to check the significance of each critical success factors in different phases of ERP system implementation.

Figure 3 Pie Chart: Employment Status of Respondents
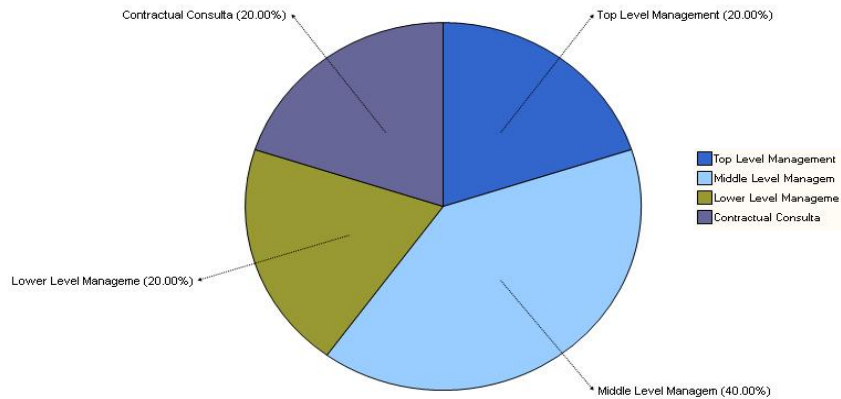
FINDINGS OF THE STUDY
Word Tag Clouds
Figure 4 shows "Word Tag Clouds" which shows the size of different words according to their frequencies of repetition in textual data. Words having more frequency show their big size. This study applied Word Tag Clouds into two phases of analysis: before funneling approach and after funneling approach. In figure 4, Word Tag Clouds shows different unrelated words such as 2011, an, can, cell, com, different, during, email, end, every, failure, first, how, iqbal, made, more, mr, much, need, new, now, number, side, so, them, thing, think, two, us, were what and you. These words are not the themes of the study.

Figure 4   Before Funneling: Word Tag Clouds

In the second phase of word tag clouds these unrelated words have been added into "stop word list" and then words tag clouds technique has been applied and in figure 5, Word Tag Clouds shows different themes of the study such as activities, assets, automatically, change, consultant, control, critical, data, department, efforts, erp, finance, financial, implementation, information, level, long, management, manager, monitor, network, newsletter, oracle, organization, people, process, success, successful, support, synergy, system, team, training and vendor.

Figure 5   After Funneling: Word Tag Clouds

Word Tree Analysis

Implementation word is the key word for this study. Therefore, using text search query a word tree has been explored for the word: "implementation". In figure 6, word tree of "implementation" shows the different pattern of talks of respondents of the study. By reading line by line data where the word "implementation" has been used, the study observed the meaning of ERP implementation and CSFs of ERP implementation in this study.
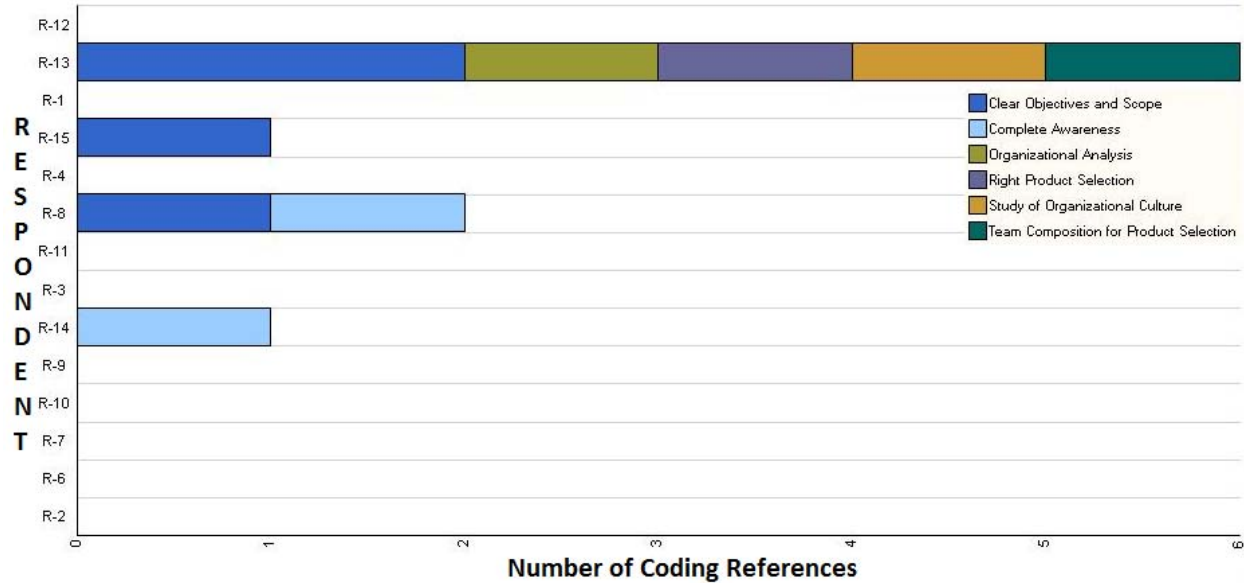
Figure 6Word Tree of the word "implementation"
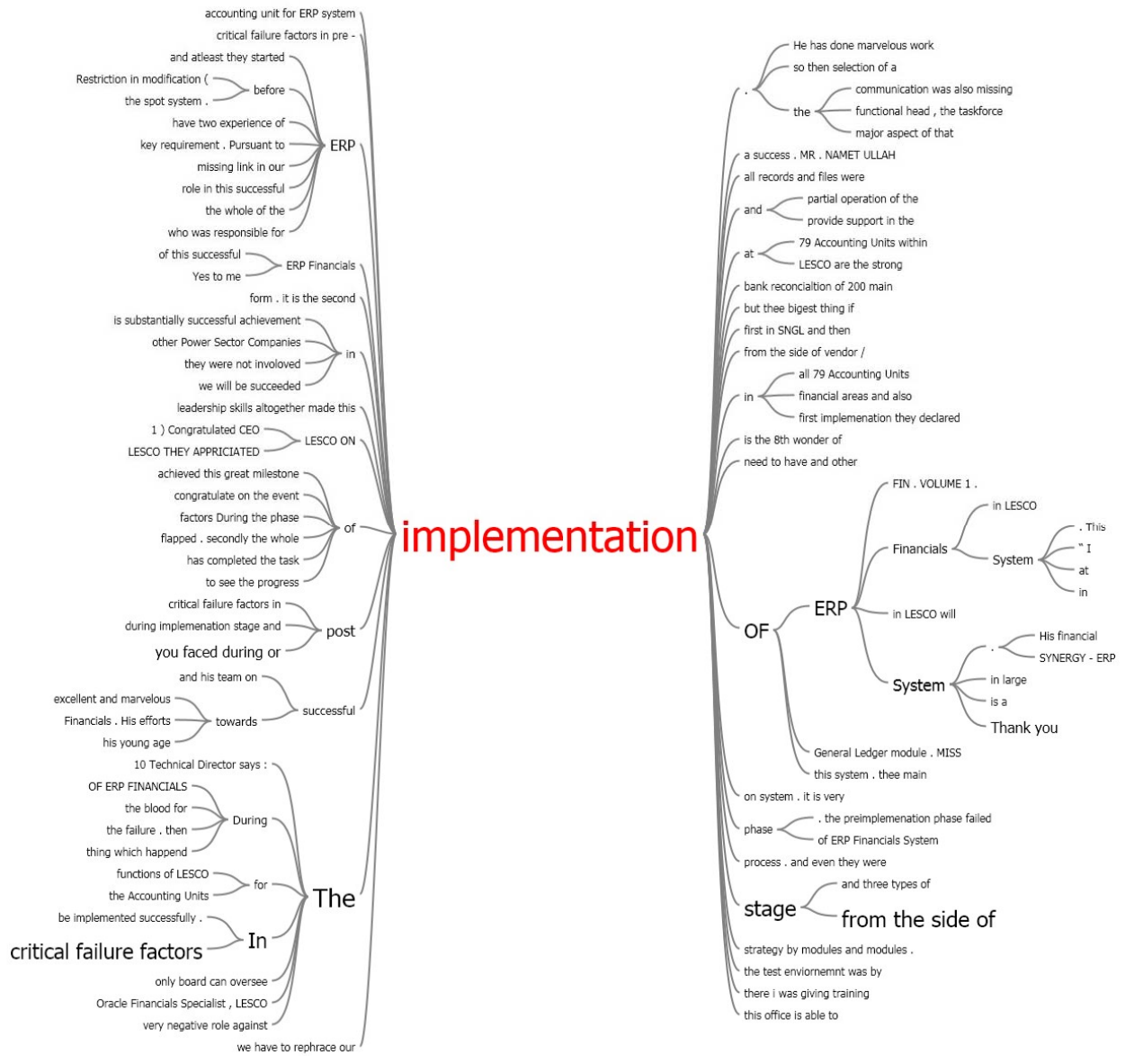
ERP Pre-Implementation Phase and Critical Success Factors

Stacked Bar (figure 7) shows CSFs in pre-implementation phase of ERP System. In this phase, the study found that clear objectives and scope, complete awareness, organizational analysis, right product selection, team composition for product selection and study of organizational culture are the CSFs of ERP System.
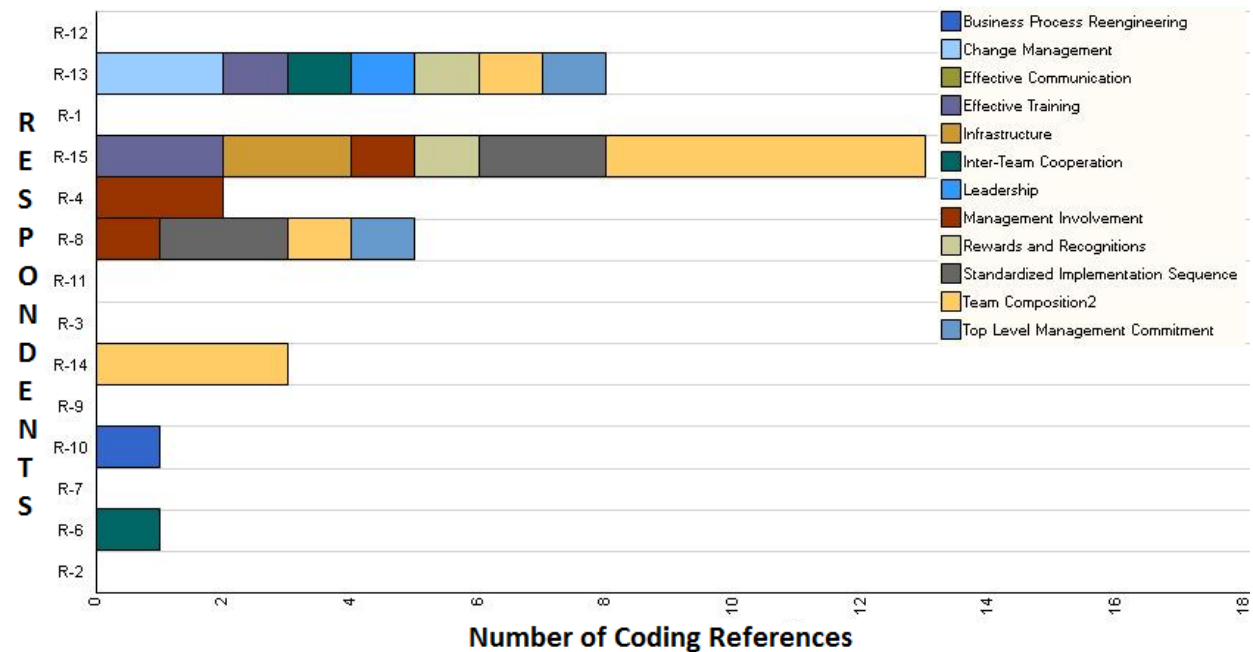
Figure 7Stacked Bar: ERP Pre-Implementation Phase and Critical Success Factors

ERP Implementation Phase and Critical Success Factors

Stacked Bar (figure 8) shows CSFs in the phase of ERP system implementation. The study identified Business Process Reengineering, change management, effective communication, effective training, infrastructure, inter-team cooperation leadership, management involvement, rewards and recognitions, standardized implementation sequence, team composition and top management commitment as the CSFs during the phase of ERP system implementation.

Figure 8Stacked Bar: ERP Implementation Phase and Critical Success Factors

ERP Post-Implementation Phase and Critical Success Factors

Stacked Bar (figure 9) shows CSFs in ERP post-implementation phase. Employee motivation, end user satisfaction, organizational productivity, professional development services, software reliability, support and maintenance have been identified as CSFs in post-implementation stage of ERP System.

Figure 9 Stacked Bar: ERP Post-Implementation Phase and Critical Success Factors
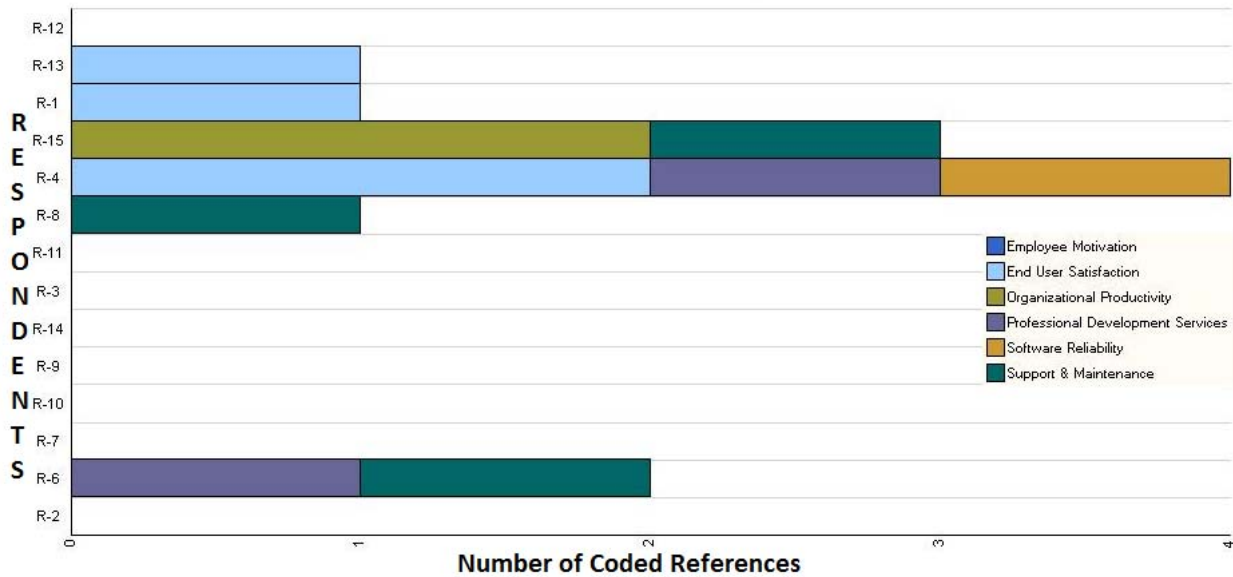
Tree Map Analysis of ERP Critical Success Factors

Tree Map shows the significance and the worth of each theme of the study. Tree map (figure 10) shows CSFs of ERP System in different phases of implementation. In implementation phase of ERP system: Team Composition, Management involvement, Standardized Implementation Sequence, Effective Training and Inter-team cooperation have been found as more critical success factors while business process reengineering, effective communication, leadership, change management, infrastructure, rewards and recognition and top level management commitment have been found as less critical factors in the phase of implementation. Similarly, Support and Maintenance, End user satisfaction have been found as more critical success factors while organizational productivity, professional development, employee motivation and software reliability have been found as less critical success factors in the post-implementation stage of ERP system. In pre-implementation stage of ERP system implementation Clear Objectives and Scope and Complete Awareness have been found as more critical success factors while organizational analysis, team composition for product selection, study of organizational culture and right product selection have been found as less critical success factors in pre-implementation stage of EPR system. Those critical success factors in the big regions are more critical as compare to those factors which are falling in the small region of the tree map.

| **Figure 10** | **Tree Map of ERP Critical Success Factors** |

Conclusion and Discussions

Using a traditional method of case study research this study was aimed to identify CSFs of ERP system in implementation, pre-implementation and post-implementation phases. A government owned organization which is engaged has been selected for the in-depth exploration of CSFs. For the collection of data, prior time appointments were taken for the smooth conduct of interviews with ERP end users (employees) and ERP consultant team members. Six interviews were recorded using video recording device and remaining nine interviews were recorded

on paper notes. All qualitative data has been analyzed using the famous software; "NVivo" a product of QSR International Australia. Clear objectives and scope, complete awareness, organizational analysis, right product selection, study of organizational culture and team composition for product selection have been identified as CSFs in Pre-implementation stage of ERP System.

The study identified Business Process Reengineering, change management, effective communication, effective training, infrastructure, inter-team cooperation leadership, management involvement, rewards and recognitions, standardized implementation sequence, team composition and top management commitment as the CSFs during the phase of ERP system implementation. Different CSFs have been identified in post-implementation stage such as end user satisfaction, employee motivation, organizational productivity, software reliability, professional development services and support & maintenance. In Pre-implementation stage of ERP System study found different CSFs such as Clear objectives and scope, complete awareness, organizational analysis, right product selection, study of organizational culture and team composition.

General Recommendations

This study presents different recommendations to those companies where ERP system is being implemented or they are planning to implement ERP system. Moreover, these recommendations are also useful for ERP consultants:

1. Organization should conduct business process reengineering to make fit the organization as per different requirements of ERP system.
2. Organization should mange the change at individual, workgroup and organizational levels.
3. Organization should make an effective communication system among employees, top level management and ERP consultants to avoid the discrepancies.
4. Organization should arrange effective training for the end users of ERP system. Continuous training may solve many problems even in the post-implementation of ERP system.
5. Company should develop a sufficient infrastructure to fulfill all requirements of ERP system. Effective network system, hardware and other technologies also lead to the successful implementation of ERP system.
6. Inter-team and inter-departmental coordination is also CSF during the phase of ERP implementation. Therefore companies should make an environment in which all teams can share their expertise and work with coordination.
7. All top level and middle level management should involve in each phase of ERP implementation. They should show their devotion and ownership.
8. Organization should follow a standardized sequence for the implementation of ERP system.
9. Team composition is most critical factor found during the phase of ERP implementation. Therefore, company should develop internal team and they should work with the cooperation of ERP consultant team members.
10. Top level management should show their commitment to complete the task in time and they should supervise all activities in different phases of ERP system implementation.
11. Company should develop a team for the selection of ERP system that can fulfill the need of the company. An effective decision for the selection of right product leads toward the successful implementation and use of ERP system.
12. Company should conduct a need analysis before selection of ERP system.
13. Top level management should understand organizational culture and should make policies how to tackle expected problems
14. Organization should make clear objectives, vision and target dates in pre-implementation stage to plan each and every thing relating to cost, resources and time.

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Biography

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