

Formulating, Implementing and Evaluating ERP in Small and Medium Scale Industries



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Abstract — To increase the efficiency and productivity, Enterprise Resource Planning (ERP) systems are implemented in corporations. However, the implementation of ERP can be extremely tricky. Due to this, many small and medium enterprises (SMEs) fail to identify the importance of ERP and address its challenge. ERP has a big role to play particularly in developing countries. There is a need to motivate SMEs to implement ERP and make it a successful business in developing countries. This need is evident as SMEs play a vital role in the economic development and stability in the developing countries. However, only a handful of details are publicly available about the success and failure factors of the SMEs in the developing countries. To motivate SMEs, this work aims to provide a list of key critical success factors (CSF) found in various ERP systems in SME related literatures. We are proposing a generic matrix of the important CSFs found in literature. This work identified the top 3 CSFs to be the top management support, change management and project management. This work further proposes a model consisting of different phases of ERP implementation to be followed. In this paper, we attempt to relate the main CSFs with the management decisions. Further, the CSFs are ranked based on the correlation with the success of ERP implementation. This can benefit the SMEs which are considering or implementing ERP better.

Keywords — ERP, success factors, CSF, SME, developing countries, implementation, planning

1. INTRODUCTION

In the past few years, many business organizations of large, medium or small enterprises have attempted to develop, design and implement the ERP system in their own way. The relative importance of CFSs in ERP implementation varies among large, medium and small enterprises, due to varying differences in terms of finances, management, availability of resources, staff levels and growth. The objective of this study is to bring in a synthesized process model for ERP implementation model phases and map it with the corresponding CSFs.

Globally, the developed countries applied and implemented the ERP system for regularization and improvement of their business streams to meet worldwide competition. They have to overcome the economic, cultural and basic infrastructural barriers. This applies to large, medium and even small scale units. The various difficulties and barriers arise from capital limitations, lack of availability of resources, poor management and etc. ERP is at the infancy stage in developing countries when compared to the developed countries. This work concludes that enterprises in developing countries pay little attention towards ERP systems. As shown in Figure 1, ERP system is central to every business that brings standardization, transparency, globalization, automation, and integration across departmental functions.



Figure 1. ERP is central to many businesses.

Though the implementation of ERP system in SMEs may not have significant incremental value in the economic growth and prosperity of a nation due to various adverse factors such as high investments, poor management and etc. But it is the way forward and must be encouraged to adopt ERP system and new technologies for SMEs as this can be a vital factor for future growth and success in the long term. There may be differences in finding the level of importance and implementing the ERP systems among large enterprises and SMEs as there are many differences in their structural, organizational, and business activities. Many survey studies were undertaken and it was estimated that 40% to 60% of ERP projects failed and organization came to a conclusion that their project was risky and costly.

The aim of this study is to estimate and specify the probable differences of CFSs in ERP implementation stated above. This study aims at finding out a well-defined system in implementing ERP for both large enterprise and SMEs to improve the success rate. This paper will first specify and classify the important CSFs of ERP project implementation,

followed by specifying the importance level of CSFs of ERP for SMEs in developing countries and mapping it to knowledge formulation, strategy formulation and evaluation matrix. The matrix can be useful in detecting the risks at the early stages of the implementation and act as a tool to guide the direction of the project. Further, it can be extended to accommodate other factors which are not included in this literature.

2. CRITICAL SUCCESS FACTOR (CSF)

We have attempted to compile a comprehensive list of 60 critical success factors based on a number of literatures [1-18]. The most cited critical success factor to succeed in ERP implementation is top management support. Almost all the literatures that discussed about ERP highlight this CSF as the crucial factor. The second highest cited CSF was project management which was cited in 15 out of the 18 literatures. The third important CSF is change management process which was cited in 14 literatures. We therefore derived the relationships among these three CSFs and listed down the relevant tasks in each CSF as shown in Figure 2.

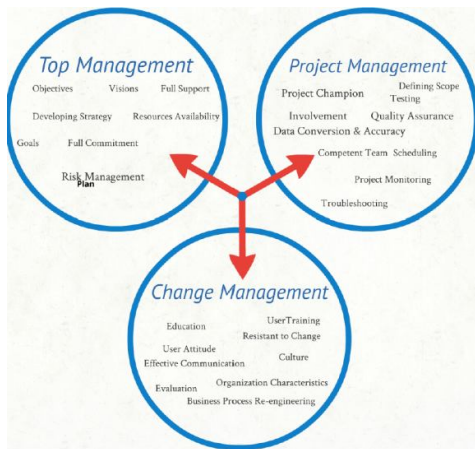


Figure 2. Top 3 CSFs and their relevant tasks.

2.1 Top Management Support

The top management support has been identified as the most important factor for the overall success of ERP implementation. It is necessary for the top management to have a clear vision, goal and business plan for the ERP [19]. Top management should clearly convey the goals and benefits of the project. For instance, setting up a steering committee to communicate and engage with the project team and employees to ensure the relevant ERP project is in the right direction and scope. Top management should justify the investment of ERP system by providing the necessary resources and adequate time for the organization to adapt to ERP system. Further, it is also crucial to align business strategy with IT strategy to have a synergy effect.

2.2 Change Management

Change Management can be referred to as anticipating the future changes [20] and effectively managing those changes. Research shows that change management is the critical factor for managing the transition in organization, user education and company culture. Company culture refers to the culture to accept changes, support changes and working towards improving through changes. Some authors have emphasised on change management to achieve sustainable competitive advantage. There is a connection between the organizational culture, change management, user involvement and education with the ERP implementation success. The organizational culture can impact the knowledge sharing which is vital during ERP implementation. The change management in an organization should not be only focusing on the training of individuals for the ease of transition and acceptance by the users, it should also focus on future considerations for overall culture of the organization. The change management is vital in all the implementation stages of the ERP in an organization.

2.3 Project Management

An effective project management promises a successful organization through succeeding in project implementation. Project management takes part in defining clear path and project scope. The project scope must be clearly defined and controlled. For instance, milestones and goals should be clearly set out, tracking of schedules should be in place, budgets and end results should be tallied to ensure a successful delivery of the project. Due to the large numbers of the stakeholders involved in the project, it is crucial to convey the activities to everyone in the organization. Also, it is crucial for the project management to resolve any issues arising from the project and to be prepared for the unforeseen obstacles.

3. PROPOSED MODEL AND MATRIX

The main aim of our research is to help and motivate SMEs to implement ERP successfully. The initial phase of our research identified the major CSFs, and their relevance to different phases of ERP implementation and enterprises system. The model that we are proposing consists of inter linkages of 3 different models in the ERP implementation as shown in Figure 3 and Figure 4. We have selected 3 key CSFs: Top management is responsible for the commitment throughout the different phases of implementation; Change management plays a vital role in the ERP implementation; Project management includes the pre-implementation, implementation, post-implementation phases. The ERP implementation considering the listed CSFs is verified for the implementation effectiveness using the Plan-Do-Check-Act evaluation method. This evaluation is applied for each phase of the project management. If the effectiveness does not meet the required results, the change management will make changes accordingly and then the procedure is repeated.

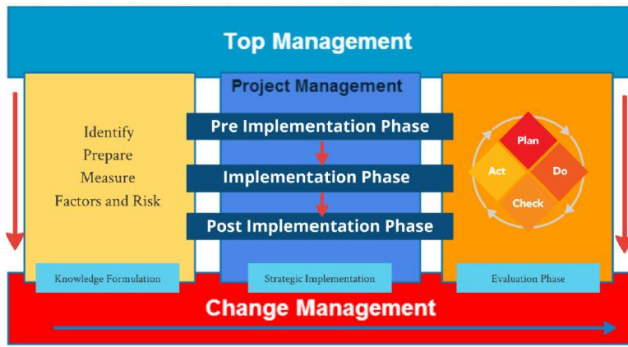


Figure 3. Proposed model integrating top, project and change management with knowledge formulation, strategic implementation, and evaluation.

		Knowledge Formulation	Strategy Formulation	Evaluation
Top Management	Pre Implementation	<ul style="list-style-type: none"> Clear Goal and Objectives Choosing ERP Vendor Selection Project Charter Selection Communication ERP benefits Technology Selection: Requirements Cultural Readiness: Organizational Budget Business Vision 	<ul style="list-style-type: none"> Business and Process analysis Initial Expert Consultation Resource planning Selection of Employees Selection of Training Technique User Education and Training Calculating Implementation Cost Time Frame for Implementation 	<ul style="list-style-type: none"> ERP Evaluation Vendor Evaluation Resource Planning Training Effectiveness Resource Utilization Contingency Plan
	Implementation	<ul style="list-style-type: none"> Business Process Re-engineering Secure Support of the Operation Leaders Resolving Individual and group Calculating the Implementation Cost Resource Allocation Data Analysis Implementation Strategy Inter-departmental communication 	<ul style="list-style-type: none"> Process Modification Employee Moral enhancement Job Redesigning Minimizing Adoption Cost Managing Inevitables Data Conversion and Migration 	<ul style="list-style-type: none"> Communicating process changes Project Monitoring Empowering Individuals Effective Resource Utilization Data Accuracy and Integrity Strategy Evaluation Communication: Strategy effectiveness
	Post Implementation	<ul style="list-style-type: none"> Vendor Support Customizing the ERP services Continual Business Process Improvement Key Performance Indicators 	<ul style="list-style-type: none"> Education on New business processes Measuring effectiveness 	<ul style="list-style-type: none"> Post Implementation Service Evaluation enhancing ERP interface quality performance Improvement Business Benefit Realization Business Vision evaluation

Figure 4. Proposed supporting matrix.

The project management has to take care of the project structure it follows. There are four major team structures used in an organization: Functional, Lightweight, Heavyweight and A-team. Functional structure concentrates on a particular functional area of the project. The teams are formed based on the common functions and they do their own implementation. Lightweight structure has functional managers, team lead, and a lightweight project manager. They aim to achieve cross functional communication through regular project team meetings. In heavyweight team structure, senior manager has direct authority in the ERP implementation. A-team is the mix of functional structure and heavyweight structure [20]. The recommended structure is heavyweight.

Implementation strategies that should be followed may not be obvious. The different types of implementation strategies are Star, breakneck, turnkey, in-house, budget, and low-risk. Of all these strategies, partner strategy is the recommended strategy as it uses both internal and external resources. It brings productivity by splitting the ERP project.

The ERP transition techniques popularly used are Big bang, phased, parallel, and process line. The recommended transition technique is slowing phasing from one phase to another where one functional module is implemented at a time in sequential order.

3.1 Knowledge Formulation

This phase is the most important part for all the project implementation stages. In this phase, all the key factors are identified and the corresponding measures are defined. This will provide a clear sense and vision and help to identify the important factors to control for this specific phase.

Knowledge formulation of the key implementation phase can be identified as the most critical phase for the whole ERP implementation. The failures of ERP projects mostly arises from management failure to identify important factors or not taking appropriate strategic measures that affect the organizational culture and employee attitude towards ERP. Figure 2 and 3 can be used in conjunction to identify and measure employee attitude and cultural readiness. For example, by conducting a survey, management can sense resistance from the employees and attempt to improve it.

3.2 Strategic Implementation

The success of this phase depends upon the key factors identified in the knowledge formulation phase. The strategic measures can be defined to control the factors. When the management identifies the resistance from the employees towards ERP, they can define and implement the strategy to reduce the resistance. For instance, explain and communicate the advantages of ERP to employees and illustrate how it is going to help them do a better job. The management can even identify the group leaders and provide them with initial education and training on ERP. Once the group leaders have picked up the skill set, they can train their peers and subordinates. In the similar manner, strategic actions can be taken and measures can be adopted to minimise the impact of major factors identified in the knowledge formulation phase.

3.3 Evaluation Phase

Evaluation phase for each project implementation phase is proposed to measure the efficiency of the measures adopted in the strategic implementation for the factors initially identified in the knowledge formulation phase. For example, the organizational culture and employee attitude can be examined through survey conducted after strategy implementation phase to measure the improvement. In this manner, management can keep track of and control the factors. The survey results can be compared with the benchmarks to justify the strategies used. In the case of survey results being unsatisfactory, the factors can be passed on to the knowledge formulation phase of next cycle.

4. CONCLUSION

The successful implementation of ERP in SMEs in the developing countries is mainly dependent on top management, change management and project management. It is not laborious to identify the CSFs and make sure they are not missed. The recommended team structure: heavyweight,

implementation strategy: partner strategy and transition strategy: phased can be followed considering the feasibility in an organization. The top 3 key CSFs are: Top management is responsible for the commitment throughout the different phases of implementation; Change management plays a vital role in the ERP implementation; and Project management includes the pre-implementation, implementation, post-implementation phases. The ERP implementation considering the listed CSFs is verified for the implementation effectiveness using the Plan-Do-Check-Act evaluation method. This evaluation is applied for each phase of the project management. If the effectiveness does not meet the required results the change management will make changes accordingly and then the procedure is repeated. The model proposed can be followed to achieve effective implementation of the ERP.

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