



## A Completeness Framework for Critical Success Factors of ERP Implementation Projects: A Stakeholders' Perspective

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### ABSTRACT

The complex and integrated nature of Enterprise Resource Planning (ERP) system is often coupled with time constraints and substantial financial commitments that inevitably make its implementation to be a highly risky undertaking. Reviews of the existing literature on the subject suggest that Critical Success Factors (CSFs) have been studied by researchers for risk aversion in ERP implementations. The review studies have often provided different listing of CSFs as per their research settings and scope. ERP projects necessitate organization wide transformation making stakeholders involvement and participation crucial for the success guarantee of the ERP project. Critical Success Factors related to stakeholders are often found in the understated position in spite of the prime contribution and difference they make to ERP implementation success story. The paper focusses on importance of identifying stakeholders' CSFs for studying, monitoring and controlling purposes. It further attempts to provide a consolidated list of stakeholders CSFs along with proper categorization.

### Indexing terms/Keywords

Enterprise Resource Planning, Critical Success Factors, Completeness, Stakeholders' Critical Success Factors,

### Academic Discipline And Sub-Disciplines

Information systems, Business Information Systems

### SUBJECT CLASSIFICATION

Enterprise Resource Planning

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## INTRODUCTION

### 1. CRITICAL SUCCESS FACTORS(CSFs) APPROACH TO ERP IMPLEMENTATION

CSFs models have been applied to general project management problems, manufacturing system implementation, and reengineering (Holland, Light & Gibson, 1999). Rockart (1979) developed the Critical Success Factors concept as a way of identifying general managers' information needs, and defined CSFs as "those few critical areas where things must go right for the business to flourish". The importance of CSFs as a means of identifying and prioritizing business needs and technical systems has been recognized in several IT planning approaches (Byrce & Byrce, 1987; Buyukozkan, Kahraman & Ruan, 2004; Buyukozkan ,Ertay, Kahraman & Ruan, 2004; Botta-Genoulaz ,Millet & Grabot, 2005). The CSFs based frameworks are expected to guide managers in the development of an implementation strategy and help them make decisions by identifying the role and influence of individual factors on each other and on the project outcome (Holland and Light 1999; Ngai, Law & Wat, 2007).

The approach has also been widely adapted to address ERP implementation issues (Bingi, Sharma & Godla, 1999;Cantu, 1999; Holland and Light, 1999; Holland ,Light & Gibson, 1999; Esteves & Pastor, 2000; Bernroider & Koch, 2001; Nah Lau & Kuang, 2001 ;Somers & Nelson, 2001; Zhang ,Lee, Zhang & Banerjee, 2002; Umble, Haft & Umble, 2003; Buyukozkan et al., 2004a; Botta-Genoulaz et al., 2005 ; Marnewick & Labuschabne, 2005; Motwani et al., 2005 ; Sun ,Yazdani & Overend, 2005; Sumner, 2006; Ngai et al., 2007). The CSFs for ERP implementation bring a concept that helps an organization identify the critical issues that affect the process of implementation. These factors are believed to have a critical impact over the ERP implementation as they will ensure a successful ERP implementation (Fok et al, 2009; Ngai et al., 2007) if carried out effectively.

### 2. STAKEHOLDERS' ROLE IN ERP PROJECT IMPLEMENTATION

ERP implementations are over and above the technical artefacts that are installed in the enterprise. ERP systems necessitate organizational transformation that affects the enterprise holistically. Apart from the difficulties that are synonymous with such changes, it is important to keep in mind that organizations are social structures made up of stakeholders whose interests converge or diverge depending on roles, values or situations. This complicates the matter even further. Undoubtedly, stakeholders consent and participation is important in view of the massive changes required. When stakeholders comprehend the proposed long-term benefits, related to an ERP implementation, acceptances of transient set-backs are more easily consented.

There are various kinds of stakeholders involved in the ERP project lifecycle. Broadly they could be classified as internal and external stakeholders'.

Types of Stakeholders	Role
<b>Internal</b>	
Top Management	Strategic ; Instrumental in driving ERP Project
Project Management Team	Executive; Instrumental in implementing ERP in organization
Project Development Team	Development: Instrumental in developing in-house ERP(in-house ERP)
ERP users	Operational; Instrumental in using ERP
ERP Support Team	Support; Instrumental in providing support services for ERP Project (in-house ERP)
<b>External</b>	
ERP Vendor	Partner; Instrumental in offering ERP product ,support and services
ERP Consultant	Partner; Instrumental in mediating between Vendor and implementing organization

**Figure 1: ERP Stakeholders'**

Akkermans & Helden (2002) also identified that the presence and attitudes of stakeholders were the root causes driving performance of the acknowledged core processes. In their particular context, it emerged that simultaneous and mutually reinforcing changes in the presence and attitudes of stakeholders enabled a change in the project directional success.

Chetcuti (2008) noted that more than half of the issues in the ERP implementation project failures are of the non- technical nature. Poor change Management, lack of top management support and inability to align business process have been cited as main reasons for implementation failure.



Shah, Khan & Bokhari (2011) explored the impediments towards successful implementation faced by public organization where the development and implementation of ERP system was outsourced to a vendor. The findings showed lack of user involvement, lack of top management support, lack of vendors experience and support, and lack of change management as impediments of ERP successful implementation. Moreover, turnover of ERP developers team members and transfer/posting or retirement from service of top management of beneficiary organization were also found as impediments towards successful implementation of ERP system. The factors mentioned caused the project to be cost over- run, behind schedule and not according to user requirements.

### 3. RESEARCH QUESTIONS

The CSFs studies at a glance appear to be a perfect set of factors available for guidance and monitoring of ERP projects from the ERP implementers' perspective. In almost all the studies, about half of the listed CSFs are associated with the stakeholders'. Still several questions remained unanswered for CSFs in general and for stakeholders' CSFs in particular.

- **Lack of completeness of reported CSFs**

Different studies have provided a different listing of CSFs as per their research setting, scope and phase wise coverage of ERP project. Further, only a few studies attempted to list CSFs through all phases of ERP project. Further, all the CSFs listed in a study may/may-not find their place in other studies as per the researchers' understanding. Hence, no visible set could be obtained as an effective and comprehensive CSFs list from the studies.

- **Lack of categorization of CSFs**

The CSFs studies have been completely lacking in the proper categorization of related CSFs. For example, the CSF such as Formulation of steering committee, Having a Business plan and Vision, ERP strategy, Top Management support, Commitment, Formulation of an implementation team with Defined roles and responsibilities and Sustained Support are all related to Top Management. These CSFs could be bought in one prominent CSF, Top Management related CSF.

- **Subjectivity in interpretation and scope of CSFs**

The interpretation of the CSFs had been highly subjective and dependent on the researchers understanding. Few studies did not even provide the basic interpretation. Further, the scope and coverage of the CSFs varied across the studies with no fixed boundaries and limitations. . For example, studies have often talked of effective project management with a solid project champion backing without concentrating on supporting essential CSFs of interdepartmental co-ordination, co-operation, time and scope of implementation.

- **Biasness towards few CSFs**

Studies have been inconsistent or lack comprehensive completeness in reporting their listed CSFs. Although, apparently the Top Management and Client related CSFs are most widely reported in the CSFs studies. The other relevant CSFs, for example, consultant CSFs have been sporadically covered. Few CSF have not been able to make it to the review studies but have become relevant in context of ERP implementation as of date. For example, Defining the scope of work for the vendor and consultant, review of vendor and consultant work plays a very crucial role throughout the ERP project implementation but have been conveniently missed in most of the studies.

### 4. RESEARCH METHODOLOGY

In order to address the above issues, a field study was conducted with 30 Indian enterprises in Delhi-NCR region in the year 2012. The companies were selected by size to include large and medium. Data was collected through an experience survey using a questionnaire. The questionnaire solicited opinions from the ERP Experts, Consultants, Vendors and implementers for determining the impact of Critical Success Factors (CSFs) on success of ERP software system in organizations. The respondents included senior level information system executives who had at least 10 years of experience in implementing and consulting ERP projects. The responses were secured by personal interviews and by e-mail.

The success factors used in the questionnaire are based on research study publication in 1999 by Cantu, R(1999), with modifications based on the noted drawbacks and inadequacies of previously cited CSFs. Each Prominent Critical Success Factor was further categorized into sub-factors for deeper understanding of their individual contribution to the impact made. A glossary of the technical terms used in the questionnaire was appended at the end of the document explaining the interpretation of terms as desired.

Respondents were asked to identify the overall degree of importance of each CSF in the overall ERP Project implementation stage using a 5-point likert scale ranging from not important to critical.

The initial mailing was done to 50 senior level executives out of whom 30 responses were collected. The development of the questionnaire had the objective of gathering information directly from people involved in ERP implementation process and to have a complete listing of CSFs as relevant, appropriate and apt in today's contextual environment.

## 5. RESULTS AND DISCUSSION

### 5.1. Completeness and Phase wise Categorization of the CSFs

The comprehensive complete CSF model based on the survey conducted by us comprises of 5 prominent top level CSFs. The CSFs are of 5 major types ranging from **Top Management/Organizational Support, Client, Vendor, Consultant and Project Management**. The detailed sub-factors under each CSF have been discussed further. The comprehensive categorization would eventually be beneficial to implementers to serve as a basic guideline to focus on stakeholders' CSFs while massive investment with enterprise wide ERP implementation is done.



Figure 2 : Comprehensive ERP stakeholders' CSFs

Below we present a detailed account of findings from the survey. We focus on each of the prominent CSFs separately and present an insight into its related CSFs which were placed under it.

#### 5.1.1 Top Management/Organizational Support

Implementing an ERP system is often a matter of repositioning the company and transforming its business practices (Bingi, 1999). Top Management / Organization Support had emerged as an important CSF in almost all of the studies ( Bingi, 1999; Somers & Nelson, 2001; Sumner, 2005; Garcia-Sanchez & Bernal, 2007; etc). The foremost thing is formulation of a steering committee with senior executive representation from all business areas affected by ERP implementation (Sumner, 2005; Plant & Wilcocks,2005). This CSF also encompasses a series of related sub-factors such as formulating Mission and Vision statement, setting clear goals and objectives of ERP project for the organization, selecting a project team with defined roles and responsibilities along with involvement, commitment and sustained support. Having a measurable attribute in terms of clear goals and objective makes analyzing the level of success easier and helps in making employees more motivated as they would know how their work will be evaluated. (Welti, 1999).

Our survey findings indicate that this CSF should take into account a long term vision and mission support for the ERP implementation along with the commitment and sustainable support in wake of significant top level personnel changes, changed market and financial position and changed strategic planning. The ERP mission and vision statement should be formulated stating the importance of ERP system in corporate mission, objectives and strategy. This should also be broadcasted to the entire company before actual implementation of ERP starts.

The top management pre-implementation work includes listing definite project goals and objectives, project team composition with well-defined roles, powers and responsibilities The top management should lead the project linking the objectives of the project with the company strategic priorities. By getting involved, top management as one of the most important stakeholders can ascertain that their expectations are clearly communicated. Further, they should act as champions for the implementation at all times and motivate employees from all levels to get involved (Mendel, 1999). Companies intending to implement an ERP system must be willing to dedicate some of their best employees to the project for a successful implementation. Internal resources on the project should exhibit the ability to understand the overall needs of the company and should play an important role in guiding the project efforts in the right direction. Companies should consider comprehensive guidelines while selecting internal resources for the project. Lack of proper understanding of the project needs and the inability to provide leadership and guidance to the project by the company's internal resources is a major reason for the failure of ERP project. Further, keen involvement, strong leadership and commitment of the management are required during all phases and stages of ERP implementation. Further, survey showed that sustained

support of the top management is another key requirement during all phases of the ERP project and especially in wake of top management personal changes.

<b>Top Management / Organizational Support</b>	Steering Committee	Defined Roles and Responsibilities for Project Team	
	Mission and Vision	Project Team Selection	
	Involvement	Commitment	
	Clear Goals and Objectives	Project Champion	Sustained Support

**Figure 3 : Comprehensive Top Management CSFs**

The statistical analysis for the Top Management shows that having clear goals and objectives followed by commitment, defined roles and responsibilities and project team selection were on the top considerations for the ERP implementers. Moreover, all the sub-factors are rated critical by the respondents making the Top Management CSF and all its related CSFs crucial for ERP implementers.

**Table 1 : Survey results for Top Management CSFs**

<b>Critical Success Factors</b>			
Serial No.	CSF Category	Mean	Std. Dev.
<b>Top Management /Organizational Support</b>			
1.	Clear Goals and Objectives	<b>4.85</b>	<b>0.366348</b>
2.	Commitment	<b>4.65</b>	<b>0.48936</b>
3.	Project Champion	4.6	0.502625
4.	Defined Roles and Responsibilities for the team	4.5	0.512989
5.	Project Team Selection	4.45	0.759155
6.	Steering Committee	4.35	0.67082
7.	Involvement	4.3	0.571241
8.	Sustained Support	4.05	0.759155
9.	Mission & Vision	4.05	0.998683

### 5.1.2 Project Management

The review studies (Tsai, Lee, Shen & Yang, 1994; Somers & Nelson , 2001 ; Ngai et al., 2008) had stressed on the terminology of effective project management terminology to encompass all the issues concerning this aspect. The survey however aimed to cover all minute aspects related to project management aspect starting from project planning to management to project review

Complexity, large resource commitment, and enterprise-wide scope of ERP projects make them an intricate exercise in planning and project management (Radding, 1999). Many ERP analysts have stressed the importance of project management and planning for successful implementation (Davenport, 2000).The ERP project plan serves as guide for the implementation and also establishes the expectations for how the project should be completed. An ERP project requires a cross-functional and multi-skilled implementation team because of its enterprise-wide scope (Davenport, 2000). The ERP project manager must have a clear vision and good communication to ensure everyone on the team knows exactly what the project is to accomplish, completing tasks within appropriate timings, adhering to budget constraints, producing deliverables as agreed to meet stakeholders' expectation. Another key area of project management is the competence of project team (Somers & Nelson, 2001). Competence of project team members in terms of insight and focus will reduce implementation time, enhance project quality and help understand and explain new concepts and processes (Brown &

Vessy, 1999). The review studies have however (Nah et al., 2001; Somers & Nelson, 2001; Umble et al., 2003; Ngai et al., 2007; Garcia-Sanchez & Bernal, 2007; etc.) had stressed on the terminology of effective project management terminology to encompass all the issues concerning this aspect. The survey further indicates that co-ordination and co-operation between functional groups poses a larger challenge as the new systems are based on a process view of the organization and necessitates ample cross-functional co-ordination. Project scope is rarely devised which results in gap between the user's requirement and implementation team. Thus, project scope and time for implementation are further essential requisites for effective Project Management. Finally, a tightly controlled project scope and time would reduce ERP implementation cost. (Gray & Larson, 2000). All these project management CSFs have been rarely sieved clearly in the review literature to show their due importance.

<b>Project Management</b>	Project Planning	Effective Project Management
	Project Team Competence	Project Schedule & Plans
	Interdepartmental Coordination	Scope of Implementation
	Interdepartmental Cooperation	Implementation Time

**Figure 4 : Comprehensive Project Management CSFs**

Within Project Management CSF, having effective project management with stress on interdepartmental coordination and cooperation CSFs were specified. Again all the Project Management related CSFs were rated critical by the respondents making it a vital CSF to monitor and control.

**Table 2: Survey results for Project Management CSFs**

<b>Critical Success Factors</b>			
Serial No.	CSF Category	Mean	Std. Dev.
<b>Project Management Aspect</b>			
1.	Effective Project Management	4.65	0.48936
2.	Interdepartmental Cooperation	4.65	0.48936
3.	Project Planning	4.6	0.502625
4.	Project Team Competence	4.6	0.502625
5.	Scope of Implementation	4.6	0.502625
6.	Implementation Time	4.55	0.510418
7.	Project Schedule & Plans	4.5	0.512989
8.	Interdepartmental Coordination	4.5	0.760886

### 5.1.3 Client/People Aspect

The survey attempted to seek all people/client related issues under one platter. A comprehensive listing of people's CSF was elusive feature of the review studies. ERP implementation has been referred to as an "organization wide revolution" due to the large number of changes it brings to an organization (Bingi et al., 1999). Benjamin & Levinson (1993) state that many organizations face problems in implementing advanced information technology projects because they put inadequate stress on the management of change brought about by the technology.

Involvement of employees reduces their resistance or fear of the new system (Mendel, 1999). Involved users are not only motivated to adapt to the new system but they also help identify and resolve potential issues early, thereby help improve implementation quality (Brown, 2001).

Training and updating employees on ERP is a major challenge as it is extremely complex and demanding. It is difficult for trainers or consultants to pass on the knowledge of ERP package to the employees in a short period of time. This knowledge transfer gets hard if the employees lack computer literacy or have computer phobia. In addition to being taught

ERP technology, employee has to be taught their new responsibilities. Training teaches new skills leading to increased confidence and enthusiasm towards the new system. The key to training lies in balancing the needs of the current work and the new system (O’Leary, 2000).

As with any new technology, an ERP system must eventually and ultimately be integrated into a larger, more complex social and technological business organization and companies. This CSF had been widely reported in the cited models in terms of Change and Expectations Management (Nah et al. 2001; Somers & Nelson 2001; Umble et al. 2003; Ngai et al 2007; Garcia-Sanchez & Bernal, 2007). Realizing the best use of technology requires knowledge of not only the technology itself but also the organization and its people for whom the technology is implemented. Managing change is arguably one of the primary concerns of ERP implementation. Knowledge about managing change in an organization should be prioritized as implementing change without any prior planning or strategy in organizations will result in confusion and instability amongst employees (Chan, 1999; Motwani et.al, 2005). Training initiatives and education are usually an integral component of change management. The implementers feel that the organization should invest in the training and education of their employees so as to enhance their ERP skills and to ensure they are capable of understanding their business processes and functions. In effect, half of the ERP implementations have failed to achieve expected benefits as a result of misjudging the efforts involved in change management (Somers & Nelson, 2001). In the absence of change management initiatives resulted in employees’ confusion, instability and resistance.

Knowledge is considered as an enterprise’s invisible assets. So far EIS such as ERP systems are developed and implemented mainly for managing physical assets of an enterprise. Due to the fact that both types of assets need to be properly managed, the integration of knowledge management and ERP becomes a strategic initiative for providing competitive advantages to enterprises.

<b>Client Aspect</b>	Participation and Involvement	Client Morale and Acceptance
	Education	Cultural & Change Management
	Training	Expectation’s Management
	Skill Development	Knowledge Management

**Figure 5 : Comprehensive Client CSF**

The survey indicates that participation and involvement of the client is required throughout the ERP project implementation phases. Further, client morale and acceptance of new system plays a vital role in establishing a healthy, people oriented enterprise system in the organization. Further, training could play a very supportive and crucial role in the whole success sequence. All remaining factors were also considered crucial and vital contributors to ERP success story.

**Table 3 : Survey results for Client CSFs**

<b>Critical Success Factors</b>			
CSF Category		Mean	Std. Dev.
<b>Client Aspect</b>			
1.	Participation and Involvement	4.65	0.48936
2.	Client Morale and Acceptance	4.65	0.48936
3.	Training	4.65	0.587143
4.	Expectation’s Management	4.4	0.680557
5.	Education	4.35	0.587143
6.	Skill Development	4.25	0.55012
7.	Change Management	4.25	0.638666
8.	Knowledge Management	4.2	0.523148

### 5.1.4 ERP Consultant

Another important features covered in the survey were the subfactors related to consultant’s role in the ERP project implementation. Literature review studies on CSFs studies have often covered only the aspects of use of consultant and the consultant cost.

Several studies have examined the factors that lead to a successful ERP implementation. Bingi et al. (1999) outline several critical factors, including the use of ERP consultants, for success in an ERP implementation. Garcia-Sanchez & Bernal (2005) determine, through a review of the literature, that having external consultants is critical to ERP implementation success. ERP Consultant External consultants bring an outside perspective to the implementation team, which may contribute to the implementation’s success ( Metrejean & Stocks, 2011; Mische , 2000; Thong , Yap & Raman ,1994; Wilcocks & Skyes, 2000). Ifenedo & Nahar (2006) showed that the use of quality external experts is critical for the success of ERP systems. The study also shows that the user of external experts is more important that even management’s support of the ERP system.

Previous studies in their literature reviews suggest that the ERP implementation team should include a mix of consultants and internal personnel. Yap, Soh & Raman (1999) found that for organizations that having effective consultants increased the likelihood of a successful ERP.

Ko, Kirch & King (2005) examined the relationship between consultants and their clients. The authors found that it was important to create an interactive environment between consultants and client personnel so that that knowledge can flow freely between the two parties. Slater (1999) indicated that external consultants should be used because they bring an external and hopefully independent point of view to the implementation team. Slater (1999) suggested that using consultants may lead to getting things right the first time but does not make any full time promises.

<b>Consultant Aspect</b>	Use of Consultants	Scope of Consultancy
	Consultant Reputation	Duration of Consultancy
	Consultant Cost	Consultant Management
	Consultant Expertise & Experience	Consultant work Review

**Figure 6 : Comprehensive ERP Consultant CSFs**

Yap et al. (1999) used three characteristics to associate the effectiveness of consultants with information system implementation success. These three characteristics were consultant experience, consultant capability, and consultant effectiveness during the feasibility study. Experience typically leads to capability. Thong et al. ( 1999) identified four variables to assess a consultant’s performance during an information system implementation. These variables were consultant effectiveness in performing analysis of requirements of the business, consultant effectiveness in recommending the proper solution, consultant effectiveness in managing the implementation, and the relationship between the consultant and the other parties involved with the project. Mische (2000) proposed several characteristics that were desirable in information systems consultants. These characteristics include communication skills; the consultant’s background, experience, and familiarity with the issues in the implementation; the ability to determine the organization’s needs and expectations and assign personnel to meet those needs and expectations; personality and chemistry; objectivity; expertise with systems implementations; and commitment to quality.

**Table 4 : Survey results for Client CSFs**

<b>Critical Success Factors</b>			
CSF Category		Mean	Std. Dev.
<b>ERP Consultant</b>			
1.	Use of Consultants	4.7	0.470162
2.	Consultant Management	4.45	0.510418
3.	Consultant Work Review	4.45	0.686333
4.	Consultant Expertise & Experience	4.45	0.686333





5.	Scope of Consultancy	4.4	0.712103
6.	Duration of Consultancy	4.4	0.712103
7.	Consultant Cost	4.0	0.861951
8.	Consultant Reputation	4.0	0.861951

The survey results show that use of consultants is recommended by the ERP survey respondents. The respondents feel that technical skills and knowledge, a commitment to producing quality work, and ability to manage the ERP implementation all essential attributes of a consultant, contribute to the effectiveness of ERP project implementation. Further, survey had brought into light the importance fixing scope and during of consultancy along with consultant management and review.

### 5.1.5 ERP Vendor

The survey findings indicate that selection of a suitable ERP vendor is a crucial CSF for consideration so as to ensure wide variety of support ranging from technical assistance to training. In addition, an organization can reduce the cost of implementation, gain multiple benefits from partnerships with the vendor, and use the vendor's customization tools. The review studies have literally sidestepped the mammoth side concerns attached to the vendor's CSF. Vendor CSF encompasses in itself the vendor's reputation, credibility, technical capability, consultancy services, and vendor's implementation approach along with vital aspects of education, training and support services. Further, vendor partnership, management and work review were also considered.

Bryce & Bryce (1987) had stressed the importance of the vendor's reputation for reliability. Goldenberg (1991) also recommends that buyers explicitly consider 'vendor reputation'. Bernroider & Koch ( 2001) have put forth the evidence that larger organizations put a higher value on 'market position of vendor' , with 35% rating this factor as 'very important' as compared with 17% of small and medium companies who rated it as 'very important.'

The company must have a fair idea of the vendor's stake in the market. A look at his background, previous experiences, and clientele will enable them to decide for a suitable vendor. His credibility will have a say on the fortune of ERP supposedly to be implemented in the company. It is very important to analyze the vendor's credibility with respect to the area of service where the company desires to implement ERP. Such an evaluation will add value and meaning in terms of making the decision of choosing the ERP vendor. At the same time ,it is not advisable to go for the best vendor in the market as said earlier for his services might not be the apt one for the company.

ERP vendors use different hardware platforms, databases, and operation systems, and some ERP software is only compatible with some companies' databases and operation systems. Thus, companies should conduct a requirements analysis first to make sure what problems need to be solved and select ERP systems that best suit their requirements. Two main aspects should be taken into consideration when selecting software/hardware: (1) compatibility of the software/hardware with the company's needs; and (2) ease of customization.

A diligent project plan, listing realistic and achievable goals and milestones should be put in place by the vendor. The selected vendor's track record of ERP implementation in past could serve as the key to estimate the time required to implement the project of similar dimension. This is vital to overcome the "IT time lag" and for meeting the changing requirements. The service quality of implementation ensuring the degree of transparency and fitness of information flow plays a vital role in generating initial small steps towards managing users' expectations and demands. The vendor should intelligently select the transition methodology for replacing the legacy system with the new ERP system. The outcome of each implementation phase should be well documented and approved from both the parties-the implementation team and the steering committee. Besides the documented phase deliverables, function specific manuals, flow charts, written procedures and minutes of meetings should also be maintained.

<b>Vendor Aspect</b>	Reputation	Implementation Strategy
	Expertise	Pricing Plans
	Technical/Quality certifications	Educations & Training Plan
	Technical Support	After Sales & Support Services
	Implementation plan	Vendor Partnership & Management
	Vendor Review	

Figure 7 : Comprehensive ERP Vendor CSFs



ERP systems are extremely complex and demand rigorous training. Training is regarded as important by both successful and unsuccessful projects. Importance on training was shared by all projects, but successful projects rated training quality higher and spent more on training. Without proper training, majority of the front-line workers will not be able to handle the demands of the new system Vendor detailed training schedules and efforts are critical to making a difference to the ERP experience of an organization.

Addition of new CSFs like Vendor partnership, Vendor Management and Vendor review are crucial in maintaining, monitoring and controlling vendor work.

The after sales service support services offered by the vendor and his commitment to it is very important in maintaining the post implemented ERP. The technical head count of vendor's support team, procedures followed for change requests, provision of different plans of support and maintenance, product upgrades inclusion in support plan, provision of 24\*7 help desk support, web based portal support for submitting online queries, downloading fixes and product information, response time for queries/faults posted by users can make almost any ERP software a good fit.

**Table 5 : Survey results for Vendor CSFs**

<b>Critical Success Factors</b>			
CSF Category		Mean	Std. Dev.
<b>ERP Vendor</b>			
1.	Expertise	4.75	0.444262
2.	Vendor Partnership	4.75	0.434162
3.	Vendor Management	4.75	0.444262
4.	Implementation Strategy	4.7	0.470162
5.	After Sales & Support Services	4.55	0.759155
6.	Technical support	4.45	0.510418
7.	Implementation Plan	4.45	0.686333
8.	Educations & Training Plan	4.4	0.598243
9.	Vendor Review	4.4	0.598243
10.	Technical/Quality certifications	4.35	0.74516
11.	Reputation	4.0	0.858395
12.	Pricing Plans	3.95	0.825578

The survey findings also indicate that most of the vendor related issues are of critical importance to ERP implementers. Vendor's expertise and his implementation strategy drew the utmost importance from the implementers. After sales and support services, technical support and implementation plan were also rated very important by the implementers.

## 6. CONCLUSION

Stakeholders play critical role in successful implementation of ERP projects. They influence ERP success and are also affected by ERP deployments. Various ERP CSFs studies have been conducted earlier but our analysis shows that they lack completeness and also the proposed CSFs remain open for subjective assessment. The premise of the study summarized in this paper was to make a "complete" listing of stakeholder related CSFs while minimizing the subjectivity in their interpretation.

After review of existing literature and carrying out a survey of industry experts/practitioners and implementers, we have identified and listed 32-stakeholder related CSFs for ERP projects. An important contribution of the work is identification of 15-new stakeholder related CSFs which to the best of our knowledge were not listed by any of the prior ERP CSFs study. Importantly, survey respondents considered the newly identified CSFs as either important or very important and in few



cases even as critical. The identified CSFs have also been logically grouped to facilitate their understanding and application in practical scenarios.

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**APPENDIX A**

**QUESTIONNAIRE FOR ASSESSMENT OF  
IMPACT OF CRITICAL SUCCESS FACTORS ON SUCCESS OF ERP PROJECTS**

This questionnaire solicits opinions from the ERP Experts, Consultants, Vendors and implementers for determining the impact of Critical Success Factors (CSFs) on success of ERP software system in organizations from stakeholders' perspective. The success factors used in the questionnaire are based on research study publication in 1999 by Cantu, R. (1) with minor modifications. Each broad Critical Success Factor is further categorized into sub-factors for deeper understanding of their individual contribution to the impact made.

A glossary of the technical terms used in the questionnaire is appended at the end of the document explaining the interpretation of terms as understood by the designer.

**Section 1: Demographic Information**

- 1.1 Name:.....
- 1.2 Designation:.....
- 1.3 Company Address.....  
.....
- 1.4 Phone/Mobile No. ....
- 1.5 e-mail.....

**Section 2: ERP Product Specification**

- 2.1 Name of the ERP adopted/implemented/developed /supported .....
- 2.2 Experience with the ERP product (in years) .....

**Section 3: ERP CSF Evaluation (Pl. see glossary for interpretation of the terms used)**

Based on your experiences and expertise in ERP, system rate the importance of the following Critical Success Factors on a 5 point scale:

(1 = Unimportant 2 = slightly important 3 = Important 4 = Very important 5 = Critical)

For each of the following CSF criteria, please encircle or tick one option to indicate your assessment of the importance of the CSF

**Product's Overall Success Criteria**

Top Management/ Organizational Support	1	2	3	4	5
Project Management	1	2	3	4	5
Client Aspect	1	2	3	4	5
Consultant Aspect	1	2	3	4	5
Vendor Aspect	1	2	3	4	5

Please specify any other overall success criteria which are not covered above.  
.....

(1) Cantu, R. (1999) Framework for implementing enterprise resource planning systems in small manufacturing companies, Master's Thesis, Mary's University, San Antonio

**1 Top Management/Organizational Support**

Steering Committee	1	2	3	4	5
Mission and Vision	1	2	3	4	5
Project Champion	1	2	3	4	5



Clear Goals and Objectives	1	2	3	4	5
Defined Roles and Responsibility for the Project Team	1	2	3	4	5
Project Team Selection	1	2	3	4	5
Involvement	1	2	3	4	5
Commitment	1	2	3	4	5
Sustained Support	1	2	3	4	5

Please specify any other CSF related to "Top Management/Organizational Support" which is not covered above.

.....

## 2 Project Management

Project Planning	1	2	3	4	5
Project Team Competence	1	2	3	4	5
Project Champion	1	2	3	4	5
Effective Project Management	1	2	3	4	5
Project Schedule & Plans	1	2	3	4	5
Participation & Involvement	1	2	3	4	5
Interdepartmental Co-ordination	1	2	3	4	5
Interdepartmental Cooperation	1	2	3	4	5
Scope of implementation	1	2	3	4	5
Implementation Time	1	2	3	4	5

Please specify, any other CSF related to "Project Management" which is not covered above.

.....

## 3. Client Aspects

Participation & Involvement	1	2	3	4	5
Client Morale & Acceptance	1	2	3	4	5
Education	1	2	3	4	5
Training	1	2	3	4	5
Skill Development	1	2	3	4	5
Knowledge Management	1	2	3	4	5
Change Management	1	2	3	4	5
Expectation's Management	1	2	3	4	5

Please specify any other CSF related to "Client Aspects" which is not covered above.

.....

**4. Vendor Selection**

Reputation	1	2	3	4	5
Expertise	1	2	3	4	5
Technical/quality certifications	1	2	3	4	5
Technical Support	1	2	3	4	5
Vendor Partnership	1	2	3	4	5
Vendor Management	1	2	3	4	5
Implementation Strategy	1	2	3	4	5
Pricing Plans	1	2	3	4	5
Implementation plan	1	2	3	4	5
Education & Training Plan	1	2	3	4	5
After Sales & Support Services	1	2	3	4	5
Vendor Review	1	2	3	4	5

Please specify any other CSF related to "Process Aspects" which is not covered above.

**5. Consultant Related**

Use of Consultant	1	2	3	4	5
Consultant Reputation	1	2	3	4	5
Consultant Experience & Expertise	1	2	3	4	5
Consultant Management	1	2	3	4	5
Scope of Consultancy	1	2	3	4	5
Duration of Consultancy	1	2	3	4	5
Consultancy Cost	1	2	3	4	5
Consultant work Review	1	2	3	4	5

Please specify, any other CSF related to " Consultant aspects" which is not covered above





## APPENDIX B : GLOSSARY OF TERMS

### Top Management Aspect

- **Steering Committee:** The committee is responsible for understanding all important project issues and making appropriate decisions to keep the project on track, gathering the updated action items status, communicating steering committee decisions, and ensuring that decisions are carried out.
- **Mission and Vision:** The organization mission and vision statement should support the ERP implementation process.
- **Involvement:** Top Management should provide a continual support in terms of its interest, engagement and involvement of organization users towards ERP implementation.
- **Project Champion:** any individual who made a decisive contribution to the innovation by actively and enthusiastically promoting its progress through critical stages in order to obtain resources and/or active support from top management
- **Clear goals and Objectives:** Top management should clearly specify the aims, objectives and expected returns from the software implementation.
- **Project Team Selection:** Top management should carefully select personnel who can handle and deliver for the ERP implementation team
- **Defined Roles and Responsibilities for the Project team:** The role of each team member as an individual and in the team should be precisely defined and responsibilities along roles have to be articulately carved out.
- **Commitment:** The top management should have a strong commitment for the ERP project right from inception to its final implementation
- **Sustained Support:** The top level should show committed stand in spite of top management personnel changes, financial expenses, patience towards managing expectations and change management.

### Project Management Aspect

- **Project Planning:** This planning is about how to complete the ERP project within a certain timeframe, usually with defined stages, and with designated resources
- **Project Team Competence:** Refers to capabilities of team implementing the ERP project.
- **Effective Project Management:** The project team should stick to scheduled timelines, budget guidelines and for smoother transition
- **Project Schedule and Plans:** The primary uses of the project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines. A schedule is a listing of a project's milestones, activities, and deliverables, usually with intended start and finish dates. Those items are often estimated in terms of resource allocation, budget and duration, linked by dependencies and scheduled events
- **Interdepartmental Coordination and Co-operation :** Refers to synchronization and co-operation required across and within areas , irrespective of functionalities--
- **Scope of Implementation:** The outcomes and deliverables should be well defined and articulated both to the vendor and the project management team.
- **Implementation Time:** refers to time required for implementation depending on business size, modules and extent of customization.
- **Dedicated Resources:** hardware and software resources dedicated to ERP project
- **BPC and Software Configuration:** Business Process Customization is the act of defining the whole work-flow from the start to closure in software. Configuration is the task of tracking and controlling changes in the software
- **Minimal customization:** refers to making minimal changes in existing hardware and software



- **Software Development & Testing:** is the development of a software product. The term "software development" may be used to refer to the activity of computer programming, which is the process of writing and maintaining the source code, but in a broader sense of the term it includes all that is involved between the conception of the desired software through to the final manifestation of the software, ideally in a planned and structured process. Software testing is an investigation conducted
- To provide stakeholders with information about the quality of the product or service under test.

#### Client Terms

- **Participation & Involvement:** ERP implementation should have active and voluntary participation
- **Client Morale and Acceptance:** refers to morale of people in implementing organization and their readiness towards accepting the implementation.
- **Education:** People should be aware of ERP implementation and should have mind-set orientation towards acceptance of the software
- **Training:** User's should be given sufficient training to learn the usage of the software, be aware of its capabilities and its limitations.
- **Skill Development:** User's should have a skill orientation development from file based process management to software based process management.
- **Knowledge, Change and Expectation's Management:** Does the software Vendor and implementing organization have provision for managing knowledge, Change and Expectation's Management.

#### Consultant Aspect

- **Use of Consultants:** refers to engaging external consultants for ERP project consultants(both business and process based)
- **Consultant Cost:** Cost incurred in utilizing the services of an expert/consultant for ERP implementation.
- **Consultant Experience & Expertise:** refers to the experience and expertise of the consultant in a domain area
- **Consultant reputation:** To be visualized in terms of reliability of vendor
- **Consultant Management:** To be visualized in terms of establish the number of hours budgeted for each week for each ERP consultant based on the major project activities planned each week and the consultant's responsibilities.
- **Scope of Consultancy:** refers to fixing the responsibility of the consultant in the ERP software scope.
- **Duration of Consultancy:** refers to the no. of hours the consultant spends on the project as the project implementation grows.
- **Consultant Work Review:** Periodically mapping consultants deliverables to the work defined in the scope charter.

#### Vendor Aspect

- **Reputation:** To be visualized in terms of reliability of vendor
- **Expertise:** Refers to the specialization domain area of working
- **Credibility:** To be measured by looking at his background, previous experience, clientele, area of domain specialization.
- **Technical/quality support capability:** Terms of hardware /software compatibility of ERP with existing company's technical capability and quality standards.
- **Consulting Performance:** Vendor's consultancy services post purchase of the ERP software.
- **Implementation strategy:** Vendor's track record of earlier implementation, service quality, transition plan and documentation plan.
- **Implementation plan:** refers to phase wise plan of implementation with team requirements, members with due



responsibilities inclusive of design aspects and project assumptions.

- **Education & Training** :Vendor’s training schedule and Knowledge transfer strategy
- **Vendor Management**: Tracking vendor scope of work as per predefined charter with active involvement and participation.
- **Support Services**: Vendor’s after sales service support including project inclusion plans, support plans etc.
- **Vendor Management**: refers to the implementation services contract with the vendor and regular monitoring of it
- **Vendor Review**: refers to performance measurement of vendor’s work on a performance matrix.

### APPENDIX C

Below, we summarize the categorized CSFs for the stakeholders as presented in the questionnaire survey and also show their coverage in terms of past literature review studies.

Critical Success Factors	Studies Adopted												
	Implementation Phase											All phases	
	Holland & Light	Dowlatshahi	Bingi et. al	Esteves & Pastor	Nah et. al	Ngai et.al	Umble et.al	Sun et al	Mary Sumner	Motwani et. al	Plant & Wilcocks	Somers & Nelson	Sanchez & Bernal
<b>Top Management Related</b>													
Steering Committee									*		*	*	
Mission & Vision	*				*				*		*		*
Business Plan & ERP strategy	*	*				*	*			*			
Project Champion					*	*			*		*	*	*
Top Management involvement	*		*		*				*			*	*
Commitment by top mgmt.							*	*		*			
Implementation Team			*		*	*	*	*		*	*		*
Roles & Responsibilities								*					
Sustained Support				*									
<b>Project Management Related</b>													
Interdepartmental Cooperation											*		
Effective project Management					*	*	*			*		*	*
Project schedule & plans	*												
Implementation Time		*	*										
<b>*Interdepartmental coordination</b>													



<b>*Scope of Implementation</b>													
<b>Client Related</b>													
Client Involvement													*
Client consultation	*												
Education and training		*	*				*	*			*	*	*
Personnel	*												
Client Morale			*										
Client acceptance	*												
Cult & Change Mgmt.					*	*	*		*	*	*		*
Expectations Management											*	*	
Skill development								*					
Knowledge management								*					
<b>Consultant Aspect</b>													
Having external Consultants			*	*		*			*		*	*	*
Consultant reputation			*										
Consultant Expertise & Experience			*									*	
Consultant Cost			*						*			*	*
<b>* Scope of Consultancy</b>													
<b>* Duration of Consultancy</b>													
Consultant Management			*										
<b>*Consultant Work Review</b>													
<b>Vendor Related</b>													
<b>*Vendor Reputation</b>													
<b>*Expertise</b>													
<b>*Technical certifications</b>													
<b>*Technical Support</b>													
Vendor/customer partnerships			*			*					*	*	
Use of vendor's development tools											*	*	



Package selection											*	*	*	*
<b>*Implementation Strategy</b>														
<b>*Pricing plans</b>														
<b>*Education and training plans</b>														
<b>*Vendor Management</b>														
<b>*After sales and support services</b>														
<b>*Vendor Review</b>														

\*additional CSFs listed as a result of questionnaire survey

Literature review CSFs along with Survey new CSFs

