

The Proposed Research Model for Successful ERP Implementation in Indian Manufacturing Sector

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Abstract- Manufacturing organizations spend lot of money and time to implement ERP thinking that after implementation, it will lead to increase in work efficiency. However, in most cases, ERP implementation results in a high failure rate. Most research has focused on the critical success factors (CSF) for ERP implementation, whereas factors such as success measures, benefits of ERP and the factors responsible for successful implementation in Indian manufacturing sectors has been discussed by very few researcher. The purpose of this paper is to identify critical success factors, risk factors, product selection factor, project management success factors, user satisfaction, tangible benefit and intangible benefits from the literature and propose a model based on conceptual framework for successful ERP implementation in Indian manufacturing sector.

Keywords- Enterprise Resource Planning, Indian Manufacturing Sector, user satisfaction, project management success, benefits, risk, CSF, product selection

1. Introduction

ERP is defined as a complex incorporated software system which automates the essential procedures of business like sales and distribution, production planning etc. and include all the data and information about vendors, customers, employees, and products [11]. ERP is defined as a configurable information system that can integrate information with information-based processes within and across various departments and functions[22].

Indian manufacturing companies are on the path of expansion because of the growing Indian economy with a rising domestic demand and global growth opportunities. To achieve sustainable growth in the economy, India and its government would have to continue the focus on manufacturing. It is this focus that is resulting in the PMI growth quarter on quarter. The continuous push on the reforms and execution would take India to fifth position globally in the list of manufacturing economies by 2020. The ambitious target of manufacturing contribution has been set to 25%-30% of GDP by 2025 as against 16% which is the current status. The revenue generated is to touch US\$ 1 trillion by 2025 and human resource required for the same will be near about 90 million[31]. Effective implementation of ERP can have many benefits in terms of production and quality improvement, improved customer satisfaction, improved decision making and better resource utilization[23],[34]. In addition to the benefits of ERP

implementation, it is the implementation complexities that makes ERP popular and notorious[22]. The report by Panorama consulting 2015 has mentioned that in the course of past five years, approximately \$6.1 million average cost has been spent on ERP implementations with an average time frame of 15.7 months [51]. The status of these projects are that 65- percent of the projects were behind schedule , approximately 58-percent surpassed their allotted budgets, and in 53- percent cases the benefit which was anticipated with ERP implementation was less than 50-percent of the measurable benefit. According to panaroma consulting the status of the projects in terms of exceeded budget remain the same in year 2016 at 57% and showed an increse to 74% in 2017. In 2016, 57% of projects exceed their initial estimated timeline and in 2017 , 59% reported that they exceeded their initial project timeline[52],[53]. The estimation seems very alarming and still there is a less clarity on how ERP systems can be implemented successfully. The increasing rate of failures that leads to monetary loss and even bankruptcy in some cases is a bigger problem. It is very essential and important to understand and innovate on the factors that would lead to successful adoption in terms of project management success, user satisfaction and organizational benefit. Our work is focused on the focused on the development of instrument for ERP CSF in Indian manufacturing sector. Our work focused on proposed model ERP successful model for implementation in manufacturing sector. The main purpose of our work is:

- 1 To identify the critical success factors, risk factors, product selection factors, project management success factors, user satisfaction factors, tangible and intangible benefit in Indian manufacturing sector
- 2 To propose a model based on these factors that will lead to the success project management along with user satisfaction and tangible & intangible benefit.

2. Literature Review

2.1 Study related to Critical Success factors

In Information System literature CSF is an established approach for finding the solution of potential cause of failure as it helps organizations to study their conditions in pre-adoption and implementation environments [48].

ERP usually exceeds the time frame for a particular project. So in order to avoid this the company should focus on the business plan, project schedules, resources needed, cost incurred otherwise the implementation is going to be

lengthy and costly [58],[60]. It is because of the project planning, organizations are able to plan and coordinate effectively the various activities in the different phases of implementation [6], [25], [80],[81]. In order to tackle the complexity of ERP projects, the ERP team plays an important role. Project team should be a mix of best people from internal staff and consultants with both technical and business competence [25], [80], [81].

Support of top management is considered as one of the top CSF[10],[59][72]. It is the responsibility of the top management to allocate valuable resources to the implementation team at right time[6],[25],[80][81]. The ERP project planning should be looked as change management initiatives rather than IT initiatives [72], [81],[82],[25],[77],[42]. According to research on SMEs by Parijat, it has been found that these organizations have little inclination in adapting the change and hence shown poor motivation to adapt ERP [54].

For successful ERP implementation [64] the issues of complexities arising from IT legacy system and business can be minimized by thoroughly understanding the legacy system. Business Process Re-engineering is a great tool in order to achieve improvement in measure of performance like quality, cost, service and speed. This tool is used for redesigning radically and assist in rethinking [59],[60]. Organization should be willing to change the business procedures to fit the product with minimum customization

Knowledge integration is a major challenge in ERP implementation. The knowledge gap [60] between the different stakeholders is a key problem in successful adoption of ERP. ERP systems design is very complicated and modules are intricately linked to one another [25], [79]-[81], [85]. If wrong data is put into one module, it will have an adverse affect on the functioning of other connected modules which leads to misleading results. Before deployment the software development, testing and troubleshooting architecture should be established because it prevents reconfiguration at every stage of implementation[63].

Training and education plays an important role in the successful implementation of any system and provides the user with the overall concepts of using ERP systems [24], [78]-[80].Users should be involved at each stage. In SMEs the main failure of ERP is due to the fact that the people handling the IT are not properly trained[8], [82], [86]. Vendor has an important role to play in the successful implementation of projects [9],[85] by providing support ranging from training and technical assistance.

2.2 Study related to Risk factors

“A ‘risk’ can be defined as a problem/event that has not yet happened but if that occurs will have a negative influence in terms of some loss or threat to the success of a project” [74]. Misunderstanding the specifications and requirement is seen as a vital risk factor, it refers as to whether ERP prerequisites investigation has truly fulfilled the requirements of business procedures thoroughly, precisely and explicitly [29]. Managing change properly and misunderstanding the requirements is associated with the requirement risk [56]. If structure of organization, duties and roles and schedule are not defined clearly there can be

lot of confusion which results in making project implementation exceptionally troublesome [3],[28]. Without having a clear vision, each effort will develop into a disaster and result into delays, raising price and jeopardizing budgets and schedules [28]. Without proper project planning, a systems development takes more time to complete and in most of the cases exceeds the budget allocated [27],[75]. This attempt of implementing ERP without experts, unrealistically compressing the schedule and extending individual workloads to 150% in order to save on cost will eventually result into budget and schedule overrun [28].

A unique challenge which an organization faces in ERP implementation is having the required skills. It is necessary to have a balance team of experts having managerial skills, knowledge about the processes and IT competence [20]. Neglecting business processes redesign (BPR) in ERP implementation is considered as a big risk in ERP project [3]. Introduction of ERP procedure causes the organization to undergo significant and disruptive alterations [3]. These changes will cause resistance, confusion, and concern among users who are using new system [20],[25],[26]. One of the ways to overcome this risk is user involvement . If proper training is not given to the user, the user will not be using the full capabilities of the system [29],[56]. It is critical to communicate what is happening, including the scope, objectives and activities of the ERP project [3], [26]. Poor communications increases the risk of rejection from the end user [56]. Top management support and participation is important for the success of the project. Lack of initiative from the top management will result in delay of assigning the different resources to the project [3],[26],[70] Having support from top-level administration will help ERP executions to remain on time and on spending plan and will decrease the risk of failure if there are issues[26].

Poor package selection poses a major threat for successful implementation of ERP. Selected ERP must be organizational fit [46][29]. Wrong ERP selection increases the risk of ERP system implementation. The risk of limited reporting capability supported by ERP is visible in ERP developed in foreign nation and implemented in local companies [3],[32],[55]. The occurrence of this risk may result in bad decision making of managers and cut back process acceptance and utilization [56],[62]. ERP system is a software package engineered on correct and timely business data, whose output is totally addicted to correct, timely and intact data[29], [62]. Incorrect data migration will bring disastrous risks to the normal operation of the enterprise[55].

2.3 Study related to product selection

The selection of ERP product in the implementation cycle is very important phase in every ERP project and the success or failure of the project, directly or indirectly depends on it.

When implementing an ERP project, vendor plays an important factor. Selecting the right vendor for an ERP implementation and its support throughout the whole cycle can often determine whether an implementation succeeds or fails[68]. Vendor reputation and support along with

stability, long track record of customer satisfaction, training capability, and technical capability, after sales support and are financially sound is highly valued criteria in the selection of international accounting software for reliability of the product [12], [48],[68]. The vendor who has experience, resource and domain knowledge of specific ERP implementation is able to provide more detailed support [14]. For a small or midsize manufacturer, the budget allocated for the ERP project is critical [15]. The total cost of ownership for an ERP project should include the initial acquisition cost of ERP license and its AMC. It should also take into account the cost of human resource, other software, hardware and networking devices acquisition cost, cost for end user training and documentation [7].

The integration of existing information systems and ERP system is a technical problem which might complicate the entire ERP project. ERP product selected should fit with parent/allied organization systems and should be compatible with other systems [11]. The modules should be integrated and provide seamless data flow among the other modules and increase operational transparency [48]. Out of the articles reviewed, most of them have acknowledged that business process re-engineering is an important criterion during evaluation of the ERP product [46]. Selected ERP product must be [46] an organizational fit i.e., how easily would it be compatible with the existing systems and also meets the functional and information needs of the organization so as to minimize customization. Usability issues like ease of implementation [15],[68], up gradation, adding of functionality and ease of use are considered to be very important factor for ERP product selection. If the usability issue [12],[36],[74] is not tackled, the implemented ERP system may face greater resistance from the system and result in less usage due to loss of users' confidence.

Most of the packaged ERP products claim to have the entire functional match with the company's business processes [51]. The packaged software does not have the generic functionality, industry-specific functionalities and the country-specific business requirements in one product [36],[39],[77]. So at the time of product selection, the functionalities covered by a particular product should be carefully ascertained.

Different ERP products have different software architecture and hence the requirement in terms of technical architecture also differs [7]. There are number of ERP implementation methodologies developed by industry experts from their experience which they have gained over many years in business. The vendor's team has an important role to play from selecting proper implementation methodology to guiding the customer through each stage of the implementation, from analysis to deployment [37].

2.4 Study related to ERP project success perception

The success of ERP implementation achievement relies upon the perspective from which individuals assess it. Traditionally ERP consultants and project managers define ERP project as successful if it is within budget, time and works within the scope and functionalities defined

at the time of project planning. Such choices are typically controlled by reference to three elements, also called as "the iron triangle" of project management, namely time, cost and output [6],[33]. So many researchers [2], [44] and reports for practitioners [45], [72] have evaluated the IT projects with the concept of so called 'iron triangle' criteria. According to Paul [54], the main focus of "iron triangle" as far as project success is on time completion of task along with cost and quality. Late finishing of the project has a negative impact not only on the project aspect related to time but also on all the aspects of project. In general the late completion of the project has a negative effect on the customer satisfaction as compared to the projects finished in time. Research concentrating on the IT industry in India identified scope, and particularly functionality inside scope, as the preeminent achievement criteria [1].

Finishing a project on time and within budget is the fundamental desires of clients as that is what is being promised by the supplier. For a long time, reviews, research and government reports demonstrate that, judged against time, cost and scope criteria, many projects seem to go wrong. ICT projects specifically are inclined to disappointment with rates as high as 70-80 % being cited by many researchers [44], [50]-[52]. However the so called 'iron triangle' is not considered comprehensive enough to assess the success of complex projects [38].

A study conducted by different researchers has revealed that 53% respondents agreed on the success measures as budget, time and scope. The most common factor for success implementation which the author's found from their study was 'satisfaction of client' [17]. The accessibility of ERP systems and the addressability of the issues arising from the ERP implementation are the degrees that define the user satisfaction for an ERP user. An ERP framework that is not fulfilling the client needs would be more averse to be adopted by the users to create significant results for the organization [81]. Most of the researchers defined the user satisfaction measurement in different ways, but the definition remains almost same.

ERP implementations are done with certain pre-determined objectives, top management considers the ERP to be successful if these objectives are met and business enhancements achieved [85]. A survey conducted among project managers at Norway [35] revealed that the system that works according to the expectation and solves the problem is ranked as the top most success, the iron triangle measures were ranked lower on the list. Another aspect which is covered by authors is impact on the organizational business metrics. It includes the effects of an ERP system implementation on the working cost of the organization, customer benefit, overall productivity gains. Improvement in business performance is the common objective of an ERP system. An ERP system helps in integrating the different business processes spread across functional departments and beyond the organizational boundary. This helps to enhance the efficiency and hence the business performance of the organization. Chien[13] categorized the organizational impacts of ERP systems implementation into tangible and intangible benefits. The benefits that can be measured against a set of objectives are termed as tangible benefits e.g., employee reduction, inventory optimization, improvement in financial reporting timelines, improved

cash flow management, benefits from economies of scale, efficient deliveries and logistics, measurable impact on revenue and profits. Intangible benefits of the ERP implementation include the resultant process implementation of BPR, always available standardized corporate data, productivity enhancement for all resources people and machinery, better decision making with the data support, sharing the easily comprehended information globally.

Project success criteria comprises of Project management success and product success. Meeting time, cost and quality are the part of project management success. The product success manages the achievement of organizational objectives. The author also established the positive relation between project management success and product success[6]. The success can be measured on the basis of short term objective and long term objective. Finishing the project in time, within budget and quality is a short term measure.

. In project success both long and short term implications should be considered. The first measurement should be done in the brief span – during product execution and directly after product completion. The second measurement can be evaluated a little later, when the product has been delivered to the client and the client is utilizing it. The satisfaction of customer can be evaluated after the customer is using the product at least for few months. The third measurement, direct success must be evaluated after a significant sale have been accomplished – mostly after one or two years.

As is evident through these researchers that one can't measure the success of ERP projects through one measure or a single model. The conclusion these authors draw from their studies is that a project should be assessed from different stakeholder's e.g; users, project managers, management point of view [73]. The conclusion from these studies is that the success of the project should be assessed from three categories: product success, which involves meeting the organization expectation, user success, which involves meeting the expectations of user and project management success which means completing project in time, within budget and scope & functionalities.

3. Proposed Research Model

There is a lot of literature which has put light on the relationship between CSF factors and success measures but the results are inconsistent. Also many success variables are proposed by researchers to evaluate the ERP success but there is hardly any research which has put light on the variable that are responsible for successful implementation of ERP in terms of CSF, Risk factors and Product selection. A comprehensive understanding of the CSF, risk factor and product selection factors with user satisfaction and project success remains elusive. From the literature it has been seen that there are number of success model having one or the other modification incorporated depending upon the need. This signifies the need for integrating the different model then developing a comprehensive model widely applicable in Indian manufacturing sector. In view of that the study develops a new model for ERP implementation in Indian Manufacturing sector.

Our practical measurement of successful implementation focuses on delivering and implementing a functional ERP product within the constraints of economics and time. First of all, we will display our applied model that depends on both practical and theoretical background. This structure would be considered as a model of ERP framework achievement assessment and the advantages from effective usage. To assess the successful implementation of ERP, three level of performance i.e. focus to deliver a functional ERP product within time and economic constraints is considered. The analysis levels considered in this model depended on three speculations: the primary theory is the 'mathematical theory of communication'[42] as utilized by DeLone [18] in there IS Success model to examine the critical success factors, risk factors and product selection factors for ERP implementation ; the second theory is the innovation diffusion theory[61] used to do the analysis of three factors : critical success factors , risk factors and product selection factors having impact on project management successful implementation of ERP and lastly the structuration theory [19]] to find the effect of ERP innovation in the performance of an organization in terms of tangible and intangible benefit.

The framework represents the three main factors in term of CSF, risk factors and product selection factors as far as working hypothesis for successful implementation of ERP in Indian manufacturing sector in terms of user satisfaction and project success is considered. A theoretical implementation process suggests that there is an explicit linkage between factors and successful ERP implementation and benefits observed thereafter. The model hypothesizes the rationale for the relationships among variables based on literature and suggest three main dimension (CSF, Risk, Product selection) for identifying the factors which are responsible for the project management success, user satisfaction and benefits . The proposed model as shown in figure 1 is referred to as the conceptual ERP implementation success model for Indian manufacturing sector.

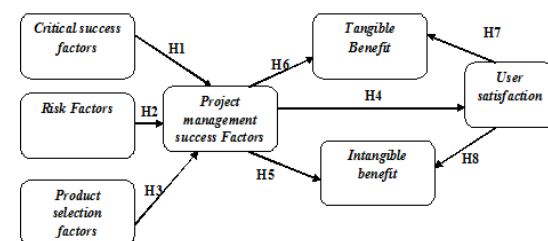


Figure 1. Proposed conceptual model of the current study

This research identifies the significant factors for CSF, Risk and product selection that affect the project management success which in turn effects the user satisfaction. The user satisfaction has an impact on the tangible and intangible benefit of the organization. This might help organization to focus on some factors which have an impact on ERP project management success and user satisfaction.

3.1 Rationality and Justification of model

This model is developed after having a deep understanding of the research questions from the existing literature. The literature covered the topics of CSF, risk factors, product selection factors along with the project management success measures, user satisfaction and benefits in terms of tangible and intangible benefits. This study has taken the perspective of end-users, project lead, CIO, top management to go evaluate the hypothetical model. This choice is supported by previous research which have studied the ERP success measures and developed models based on user satisfaction and major benefits for the organization [4],[18],[31]. The proposed model is the combination and modification of the existing model of TAM, TFF, D& M and balance score model. Therefore the proposed model provides a better understanding about the factors responsible for successful implementation in terms of project management success, user satisfaction and benefit. This helps organizations to focus on the factors which help to implement ERP successfully.

4. Variable Definition

4.1 Independent variable (IV)

Independent variable is the variable that the experimenter can measure directly, manipulate or change them. This variable is assumed to have a direct effect on the dependent variable.

4.1.1 Critical Success Factors

The critical success factors were adapted from Madapusi [40] and validated by the researcher (Submitted to BIJ-05-2018-0123). These questions attempt to ask the respondents about the importance of CSF on the project management success.

Table 1. Constructs and measures for critical success factor

Construct/dependent exogenous variable	Independent/endogenous variable	References
Critical success	Top management support	(Holland & Light, 1999) ; (Madapusi, 2008) and (Sar & Garg, 2018)
	Project head and team members knowledge	
	IT infrastructure provided	
	Target and effective communication among all stake holders	
	Troubleshooting of the system was considered	
	Suitable hardware and software were selected	
	Users were involved and provided training at each stage	
	Project goals and missions	
	Setting of realistic milestones and end dates	
	Establishing project scope clearly	
	Coordination of project activities across all affected parties	
	Balanced or cross functional team	
	Retention rate of team members	
	Business plan and vision	
	Existence of project champion	
	Best people on implementation team	
	Empowered decision makers	
	Full time team members	
Domain knowledge and experience of vendor and consultant		
Training support of vendor and consultant		

The ERP project implementation is a very complex process. No of factors have to be taken into consideration while implementing the project like project team, project

planning, management support, client support etc. From Project Management perspective, critical success factors (CSFs) are characteristics that have a positive impact on the success implementation of ERP in terms of budget, time, scope, functionality and quality.

Top management plays an important role in the success or failure of any business effort. Engineering and production managers should actively participate in the organization's planning process with senior managers and top managers in order to understand the objective. Project lead is one of the most important factors in the implementation of ERP systems. Project lead should understand the technology, the business as well as the organizational context. User usage of project and adaptation of the system in their daily work processes is considered as an important factor for successful implementation because the long term success is measured on the usage of the system. Users should be involved in the definition of the project and later on in the implementation stage also.

For successful implementation of ERP the organizations should follow the project management strategies to control the implementation activities. The goal and scope of the project must be clearly defined and should be limited. Any change in scope should be defined in terms of additional time and cost effort required. Milestone and the critical paths of the project should be determined. Deadlines should be adhered to in order to complete the implementation in time , within budget and maintain credibility.

In order to have the success in project management the project lead and team members should be given responsibility. The core team should be a cross functional team as ERP integrates all functional departments of an enterprise. The skills, knowledge and experience of the project manager determine the success of the project. The team working on the project should have both technical and business requirement knowledge of the company.

4.1.2 Risk Factors

The risk factors were adapted from Peng [54] and validated by researchers (submitted to BIJ-05-2018-0124). The questionnaire attempted to ask the respondents about the risk factors the ERP implementation is exposed to. The question asks about risk of basic data, scope, skilled people, legacy system, selection of consultant and vendor.

Table 2. Constructs and measures for risk factor

Construct/dependent /exogenous variable	Independent/endogenous variable	References
Risk Factors	Risk of lack of top management commitment to the project.	(Peng & Nunes, 2010; Sar & Garg, 2018)
	Risk of low key user involvement	
	Risk of inadequate training to the user.	
	Risk of team leader lacking specialized skills required by the project.	
	Risk of inappropriate level of competence of staff.	
	Risk of poor project planning and control.	
	Risk of inappropriate selection of consultant and vendor	
	Risk of ineffective communication	
	Risk of ineffective strategic thinking and planning	
	Risk of inadequate financial management.	
	Risk of inadequate change management.	
	Risk of inappropriate technology selected for implementation.	
	Risk of system security.	
	Risk of inaccuracy of basic data.	
	Risk of non-availability of Hardware.	
	Risk of inadequate IT infrastructure.	
	Risk of inadequate BPR.	
	Risk of lack of managing cultural change in an organization.	
Risk of changing scope and objective.		
Risk of sticking to legacy system.		
Risk of non-retention of skilled people.		

ERP implementation modifies the way the organization operates and is not only related to technology. If the effort to be used in change management is not understood properly, the implementation is going to fail. During change management initiatives it is recommended that employees should be involved from the very beginning, employees concerns should be addressed and support group should be there to mitigate the effect of resistance to change. Users without proper training will find the new system difficult to use, thus they show resistance to the new business model and stick to the legacy system. Many enterprises have no basic management system and they lack in management of basic data. Data preparation and management is the most complicated and most time-consuming job, with the largest workload, involving the most extensive aspects, and is most likely to incur huge costs. Organization must establish scientific and reasonable data system consistent with ERP requirements, in order to ensure accurate, timely and complete data. Enterprises must fully carry out business process reorganization and optimization before implementing ERP system. ERP packages offer many business practices that might be included as part of a BPR but there is a need of continuous process improvement. To do continuous improvement, the use of outside consultants is required for ERP projects. The knowledge of the modules, experience, technical and organizational acumen and experience with similar software applications and implementation management play a major role in reducing risk. To neglect business processes reengineering is a risk in ERP project. Project management activity spans throughout the life cycle of ERP implementation. The biggest risk which ERP faces is the non clarity in the scope of the project. Goal and scope of the project must be clearly defined in the planning phase and should be limited. Any change in scope later in the project means additional time and cost effort required. Milestone and the critical paths of the project should be determined. Deadlines should be adhered to in order to stay within the schedule and budget and to maintain credibility.

4.1.3 Product selection factors

The product selection factors were adapted from P.Garg[49] and validated by author(Submitted to BIJ-05-2018-0125). The questions ask the respondents about how well the ERP software selected is reliable, has reporting and analysis features, fits with parent organization's system, easy to learn and maintenance and up gradation cost.

Table 3. Constructs and measures for product selection factors

Construct/dependent /exogenous variable	Independent/endogenous variable	References
Product selection	Maintenance costs	(P.Garg & R.Khurana, 2013; Sar & Garg, 2018)
	Implementation time	
	Training support	
	Reporting and analysis features	
	Warranties	
	Financial condition	
	Domain knowledge and experience of vendor	
	Training performance of vendor	
	Technical support capability of vendor	
	Ease of Learning	
	Fit with parent/allied organization's system	
	Ease of operation	
	Ease of in house development	
	Scalability	
	Reliability	
	Flexibility	
	System interoperability	
	Up gradation costs	
	Consultant expenses	
	Implementation Methodology of software	
Delay penalties		
General functional requirement		
Industry specific requirement		
Security Level features		

Ferrari [22] confirmed that product selection is considered as one of the important factor for ERP implementation success. The project implementation will fail if the capabilities of project and requirement are confused with an organization's business processes. Thus, this factor should be viewed as a standout amongst the most imperative factors that can have a direct impact on the ERP implementation success failure or success. The product selection factors should define the degree of customer satisfaction. The objectives is that the product that is user friendly, easy to customize and fits with parent/allied organization system. , ease of learning.

System reliability guarantees the delivery of information to the clients and hence it is an imperative segment of the product selection. This feature partly influences how well an ERP plays out its expected functionality capacity. A standout amongst the most critical focal points of ERP system is to give real time and exact data. This advantage can be undermined if product isn't reliable. Therefore reliability of the product is considered as an important factor that affects the project management success in terms of quality and functionality.

Traditional measure of selecting the software is the financial perspective. Financial perspective should not only take the cost of product. Total cost of ownership (TCO) should be the basis for comparison of software product. TCO should include up gradation and maintenance cost also. TCO is a significant factor that influences ERP strategies and decision

4.2 Moderating Variables

A moderator variable, is a variable that has an impact on the strength of the relationship between a dependent and independent variable

4.2.1 User Satisfaction

User satisfaction factors adapted from DeLone [18] & Davis [17] is used as one of the important success measures. There are questions related to user satisfaction, effectiveness, performance, productivity, effective decision, overall usefulness, and freedom from repetitive work, ease of work.

Table 4. Constructs and measures for user satisfaction

Construct/dependent /exogenous variable	Independent/endogenous variable	References
User satisfaction	Using the ERP system improves the user performance	(Davis F. D., 1989; DeLone W. a., 1992)
	Using the ERP system improves user productivity	
	With the ERP systems, user need not to do the " repetitive work " again	
	Using the ERP system improves user effectiveness	
	The ERP system improves the information quality	
	The ERP system can help user make effective decisions	
	Over all using the ERP system is very useful for users job	
	ERP system is easy to use	
	Overall, I am very satisfied with the ERP system.	

From the literature it is clear that user satisfaction is considered as the most important factor for measuring the success of information systems [18]. It is hard to deny that if users are satisfied with the product the success of an information system is inevitable. It is hypothesized that there is a high correlation between user satisfaction and tangible and intangible benefit.

4.3 Dependent Variable

Dependent variable is the variable measured by the researchers, after changing the values of the independent variable. The value of dependent variable depends on the independent variable.

4.3.1 Tangible Benefit

The factors for tangible benefits are adapted from Al-Mashari [84]. The questions were framed to get idea about how organization are benefitted tangible in terms of sales growth, lower inventory, reduced labour and increased productivity.

Table 5. Constructs and measures for tangible benefit

Construct/dependent /exogenous variable	Independent/endogenous variable	References
Tangible Benefits	ERP has helped in sales growth	(Al-Mashari, Al-Mudimigh, & Zairi, 2003)
	ERP has helped in lowering inventory cost and reduced out of inventory events	
	ERP has helped in overall cost reduction by automating functions	
	ERP has helped in reducing head count	
	ERP has increased the transparency in costing information.	

4.3.2 Intangible Benefits

The factors are imported from Zaira [84] It basically focuses on the intangible benefits to an organization and covers the area like scheduling production activities, reduced delivery cycle time, improved forecast accuracy, improved after sales service.

Table 6. Constructs and measures for Intangible benefit

Construct/dependent /exogenous variable	Independent/endogenous variable	References
Intangible Benefits	ERP has helped in automating the scheduling of production activities	(Al-Mashari, Al-Mudimigh, & Zairi, 2003)
	ERP has improved product delivery cycle time	
	ERP has improved forecast accuracy	
	ERP has improved the timeliness of after sales service	
	ERP has helped in time reduction of product design	
	ERP has helped in checking of project work in advance	
	ERP has helped in capacity utilization	
	ERP has improved bill-of-materials management	

4.3.3 Project Management Success

In this case the project management success is defined in terms of IT staff which generally considers the ERP as a success when the project is completed in time, budget, scope is matched with the company need and quality of project is good. The project success was adapted from Ram, & Wu [60]

Construct/dependent/exogenous variable	Independent/endogenous variable	References
Project Management success	The ERP implementation project was completed on time	(Ram, Corkindale, & Wu, 2013)
	The ERP implementation project was completed within the budget as initially planned	
	The scope of our ERP system is well matched with our company needs	
	The ERP product has general functional requirement	
	The ERP product has industry specific requirement	
	The quality of our ERP project is very good	

Table 4.3.3 Constructs and measures for project management success

Lot of researchers has focused on measuring the project management success of the ERP implementation. the success of ERP projects can be defined for the different phases of development life cycle. Mostly three different stand points are considered which are:

- 1 Operational, which means that when the ERP is implemented it should the anticipated functionality.
- 2 Financial, this means that the focus of ERP implementation should be to take into consideration the key organizational performance indicators.
- 3 Project implementation, which means that the project management success of an ERP project would be considered if the implementation is completed within budget and time frame.

This research assumes that its direct antecedents are CSF, risk related factors and software selection. Its relationship with other dependent variables will be empirically examined in the later part of research.

5. Hypothesis development

The following ten hypotheses will be the working hypothesis for this research:

H1: There is a positive relation between CSF and ERP project management success in the Indian manufacturing sector.

H2: There is a positive relation between risk factors and project management success in the Indian manufacturing sector.

H3: There is a positive relation between product selection factors and the ERP project success in the Indian manufacturing sector.

H4: There is a positive relation between project management success and the User satisfaction in the Indian manufacturing sector.

H5: There is a positive relation between project management success and tangible benefit in the Indian manufacturing sector.

H6: There is a positive relation between project management success and intangible benefit in the Indian manufacturing sector.

H7: There is a positive relation between user satisfaction and intangible benefits in the Indian manufacturing sector.

H7a: There is a mediation effect of user satisfaction on the relation between project management success factors and intangible benefits in the Indian manufacturing sector.

H8: There is a positive relation between user satisfaction and tangible benefits in the Indian manufacturing sector.

H8a: There is a mediation effect of user satisfaction on the relation between project management success factors and tangible benefit in the Indian manufacturing sector.

To find out whether the hypothesis has been accepted or rejected, survey method of collecting data will be used. Before conducting final survey, a conceptual model is constructed based on the dependent variable, independent variable and moderating variable. The relationship between these variables is defined in the model. The survey questionnaire is designed taking into consideration these variables and the relationship between them. The observations will be collected from the cross sectional people associated with ERP implementation in Indian Manufacturing sector. The conceptual model will be analyzed using factor analysis, reliability test, validity and confirmatory analysis test using AMOS.

6. Conclusion

The primary objective for this research-in-progress is to focus on the theoretical framework, conceptual model definition, construct and variable definition and hypothesis formulation for development of successful ERP implementation model in Indian manufacturing sector. The study explains the foundation of the model proposed and proposes the relation between critical success factor, risk factor and product selection factor factors to find the impact on project success which in turn will result in user satisfaction and finally the benefit to the organization. This research puts light on new dimension for understanding the ERP successful implementation by combining constructs for successful implementation with project management theory, user theory and organization theory. Based on this theory, it is proposed that success project management measures (PM) will have the positive impact on the user satisfaction (US) which in turn will result in more benefit to the organization (BM). Therefore, ERP success is defined in terms of the organization's project management success, organizational benefits and user satisfaction.

This study model can give an input to the researchers, practitioners, users to find out the potential benefits of ERP systems. This model explores the relationship between different factors and how interrelation can improve user satisfaction which can lead better managed organizational resources. The model is based on in depth review of literature from previous work done and in-depth discussion with the focus group. The benefit of this research will be to identify the areas responsible for successful implementation and show the outcome of the implementation in terms of project management success metrics like scope, functionality, budget and schedule. This will result in avoiding implementation mistakes thereby increasing the success rate. This is a theoretical model and the next step is to validate this model empirically.

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