An examination of Post Implementation Success determinants of Enterprise Resource Planning: Insights from Industrial Sector of Pakistan

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***Abstract*— Enterprise Resource Planning (ERP) is an integrated software package which has been adopted extensively by numerous organizations to survive in this technology-driven era. There are several studies that have investigated the critical factors for the success of ERP. However, some organizations are facing issues to get the desired benefits even after implementing ERP packages. The current study will focus on the key determinants that ensure the post-implementation success of ERP systems. This research is based on the Technology-Organization-Environment (TOE) theory. In this study, project management posited as a technological aspect, leadership involvement as an organizational aspect while external support depicted as an environmental aspect. An empirical analysis was done in the context of the industrial sector of Pakistan. The results depict the strong influence of project management, leadership involvement and external support on ERP post-implementation success. This research delivers practical as well as theoretical implications by providing an integrative model of critical factors for ERP success at Post-implementation phase.**

***Keywords*—** *Enterprise Resource Planning, Project management, External Support, Leadership Involvement, Technology-Organization-Environment (TOE) theory, post-implementation success*

1. Introduction

Rapid technological advancements in this modern era have transformed organizations operational procedures and companies have to improve its competitive advantage in order to survive [1], [2] consequently, real-time integration with suppliers and buyers have become vital for success [3]-[4].

Enterprise Resource Planning (ERP) is a platform that helps an organization to integrate internal data for operational efficiency and reduce lead times [5]. Its use has reshaped the existing procedures of the organization to synchronize each other proficiently [6] by integrating the business processes through organizational functions and ensures updated communication throughout the whole supply chain. This could enhance efficiency, reduce transportation and logistics expense [7]. In the meantime, as information and operations are being integrated to accelerate enterprise strategic decisions, many organizations are adopting enterprise solutions to maintain their competing share in the market [8]-[12].

On the other hand, despite the large-scale ERP adoption by many organizations to achieve competitive edge [13], [14], the use of Enterprise systems has failed to increase performance after implementation in multiple cases [15]-[17]. Various studies depicted that ERP system mostly unable to produce desired benefits after the implementation phase [18]. Researchers found several reasons of ERP failure [19] like over budget and unable to produce required output but still gap to dig out critical drivers that impact ERP success at post-implementation phase [20]-[21]. This study proposed framework to evaluate critical drivers that influence the ERP post-implementation success in industrial sector of Pakistan through quantitative survey using close-ended questionnaire.

In developing countries, including Pakistan, due to the scarcity of research study of major aspects that extends to ERP success is crucial [22]. The research question of this study is "What are key determinants of ERP success at a post-implementation phase in the industrial sector of Pakistan using TOE theory? To address this research question, this study posited research model based on the theoretical framework of TOE theory and survey conducted in Pakistan industrial sector.

2. Literature Review

ERP phrase was first used by Gartner Group in the beginning of the 1990s [23]. Material requirement planning (MRP) was the first stage of ERP evolution which further enhanced to Manufacturing Resource planning (MRP II) form that supports basic functionality of back-office [24]. Later they evolved to ERP system which integrates back-office as well as front office activities. ERP system integrated the supply chain functions and sale force automatic operations. Manufacturing sector initially utilized the ERP system later service sector also adopted ERP system [25].

There are three phases of ERP implementation, the first stage is the pre-implementation phase, the second phase is known as During-Implementation phase. While the last stage is called the post-implementation phase. Many studies have focused on the Pre and During implementation phase while fewer works were done at Post implementation phase. It is believed this phase is more crucial from the organizational performance perspective because at this stage, the higher management is keen to get desired results after billion of investment in ERP implementation and in case of failure organizational may collapse sometimes. This study focuses on the post-implementation phase which is very critical as per organizational main interest. Post-implementation success can be measured in multiple aspects like operational efficiency, better decision making, strategic advantages, IT infrastructure enhancement, profitability benefits [26]-[27].

TOE theory explains the adoption and implementation of information system in an organization [28]. Initially, the TOE theory was used to elaborate the ERP adoption phase, but later, it was used to explain the determinants of the post-implementation phase [29]. The technology aspect of TOE theory depicts the quality of the information system so that it can easily be implemented in an organization. Meanwhile, the organizational aspect refers to the characteristics of management structure and organizational readiness to adopt the information system because ERP system changes the organizational structure, so it must be willing to adopt change. The last facet of TOE theory known as the Environmental aspect that shows the external sources outside the organization, ERP implementation require a higher level of technical knowledge which sometimes lack in the organization, so it may outsource experts. TOE theory can provide better insight to determine the key drivers of post-implementation success in an organization.

3. Research Model and Hypothesis development

A research model as shown in Figure1, was developed based on the theoretical background of TOE framework. It is posited that project management, as a technological aspect, leadership involvement as an organizational aspect and external support as an environmental aspect. It will impact the post-implementation success of ERP.

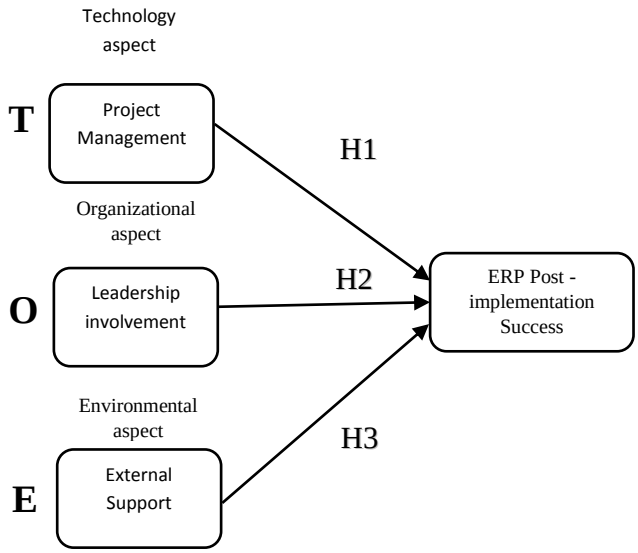

Figure 1. Research Model

3.1. Project management

Project management supports organizations' implementation of ERP system by providing a planned mechanism that synchronizes each process smoothly. This enables the ERP system to provide real-time information to each department in an organization [30]-[31]. This increases effective decision making.

Project management also allows the automation of operations by decreasing lead times and service time to deliver output that improves the overall productivity of the organizations and reduces errors caused by manual work. It also increases operational advantages [21].

Hypothesis 1. Project management has a positive effect on ERP post-implementation success.

3.2. Leadership Involvement

Leadership involvement plays a very crucial role in the post-implementation success of ERP. This is because top leaders have the supreme authority and are responsible for the allocation of sufficient resources at the implementation phase for the deployment of the ERP system. Their active involvement can bring high motivation and prioritization of necessary resources to mobilize the abilities to produce efficient results [21]-[32].

ERP system not only brings changes in the operations of the business but also modify the traditional management procedures. It integrates the traditional distribution system by altering the powers and reallocation of sources which may create resistance among end users. Top leaders play an active and positive role at this point as they have the authority to control the employee's behaviors and get optimal benefits from the ERP system [32]-[33].

Hypothesis 2. Leadership involvement has a positive effect on ERP post-implementation success.

3.3. External Support

The ERP Post-implementation success in an organization is influenced by external factors [30]. Sometimes organizations do not have enough skills or capabilities to get optimal benefits from ERP deployment in that case, they need support from ERP consultants and local official partners. ERP consultants are expert as they already deployed ERP system at various organizations and can handle the issue in a more effective away compared to the in-house technical team. In a similar way, ERP vendors continue their support to the organizations at the post-implementation phase to sustain the performance of ERP system [34].

Hypothesis 3. External Support has a positive effect on ERP post-implementation success.

4. Research Methodology

This study was conducted at an industrial level as the unit of analysis is organization. Total 540 companies list was obtained from ERP official partners through emails and personal calls. This list comprised the firms including manufacturing, Service and retail sector that have already implemented ERP system (i.e. Oracle, SAP, Microsoft). The survey was conducted to collect data. The instrument contains well-established constructs as shown in Table 1.

The questionnaires were couriered to the whole population of study 540 companies. Stamped self-addressed return envelopes were attached to each questionnaire. After two months, only 46 questionnaires were received. Further follow-up calls were made, and 36 more questionnaires were returned. Finally, a total of 82 completed questionnaires were received with a 33% response rate.

5. Results

5.1. Respondent Profile

The demographics of respondent reflected that 9.93% are females, while 90.06% are male IT managers working in the industrial sector of Pakistan. Furthermore, 2.64 % has less than one-year experience, 5.29% has more than one but less than two-year experience, 92.05% have more than three years' experience supervising ERP system activities in an organization.

Table 1. Survey Instrument detail

Constructs	Items	Source
Leadership Involvement	Allocation of sufficient resources ERP deployment as a top priority Strived for support A team of top-notch Personnel	[31]
Project Management	Clear scope and formal plan Competent project manager The progress of ERP initiatives	[30]
External Support	Support from the consultant Assistance from the vendor Support from upstream suppliers	[35]
Post-implementation Success	Achieve substantial benefits Managerial decision efficiency Reduction in cost Enhanced Customer Satisfaction	[36]

5.2. The Measurement Model

Partial least square technique was used to analyze the reliability and validity of the instrument. The reliability is checked through internal consistency method [37]. There are two types of validity examined in the measurement model, one is convergent validity which is ascertained by analyzing Average variance extracted and composite

reliability. After running the PLS algorithm (see Figure 2), it was revealed that items have convergent validity is high, as the Average variance extracted (AVE) is greater than 0.5 cut off value and the composite reliability is greater than 0.7 as suggested by [37] shown in Table 2. Meanwhile, the second type of validity is discriminant validity which is measured by cross loading method [38]. The result depicts that measurement is discriminant valid where all indicators loaded highly on their respective constructs as demonstrated in Table 3.

Table 2. Constructs Reliability and Validity results

Constructs	Items	Loadings	AVE	CR
External Support	ES1	0.817	0.572	0.800
	ES2	0.705		
	ES3	0.742		
Leadership Involvement	LI1	0.939	0.703	0.873
	LI2	0.935		
	LI3	0.595		
Project Management	PM1	0.657	0.634	0.873
	PM2	0.829		
	PM3	0.806		
	PM4	0.877		
ERP Post Implementation Success	PS1	0.930	0.616	0.862
	PS2	0.864		
	PS3	0.673		
	PS4	0.632		

Note: ES= External Support, LI= Leadership Involvement, PM= Project Management, PS=Post-Implementation success of ERP

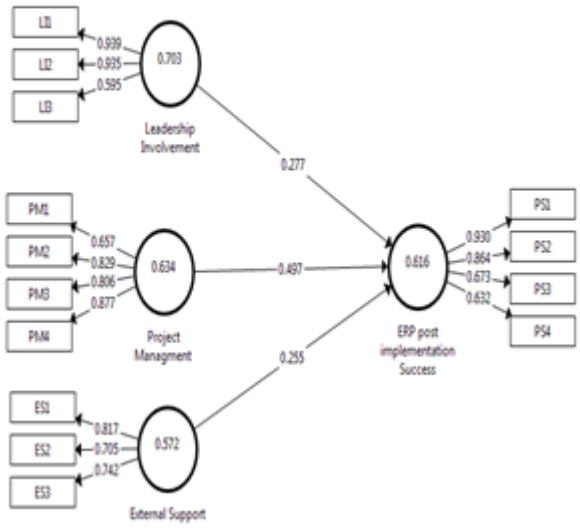

Figure 2. Measurement Model using PLS-Algorithm

Table 3. Discriminant validity using Cross-Loadings

	ES	LI	PM	PS
ES1	**0.817**	0.474	0.471	0.633
ES2	**0.705**	0.442	0.540	0.550
ES3	**0.742**	0.423	0.566	0.538
LI1	0.488	**0.939**	0.567	0.681
LI2	0.494	**0.935**	0.525	0.666
LI3	0.518	**0.595**	0.515	0.505
PM1	0.420	0.309	**0.657**	0.453
PM2	0.573	0.554	**0.829**	0.734
PM3	0.495	0.507	**0.806**	0.719
PM4	0.682	0.608	**0.877**	0.746
PS1	0.727	0.770	0.770	**0.930**
PS2	0.766	0.729	0.705	**0.864**
PS3	0.447	0.376	0.610	**0.673**
PS4	0.348	0.341	0.572	**0.632**

Note: ES= External Support, LI= Leadership Involvement, PM= Project Management, PS=Post-Implementation success of ERP

5.3. The Structural Model

The evaluation of structural model includes obtaining T-values, and beta values to check the significance of hypotheses [37]. The results (see Table 4) show that all hypotheses are supported. Further project management with path coefficient 0.497 is more influential than other factors leading to the ERP post-implementation Success.

Table 4. Hypothesis Testing

Hypothesis	Relationship	Std Beta	Std Error	t-value	Support
H1	ES->PS	0.225	0.073	0.000	YES
H2	LI->PS	0.227	0.082	0.000	YES
H3	PM->PS	0.497	0.095	0.000	YES

Note: ES= External Support, LI= Leadership Involvement, PM= Project Management, PS=Post-Implementation success of ERP

6. Discussion and Implications

Based on Technology-Organization-Environment theory, this study postulates that the Project management, leadership involvement, and External support positively influence the ERP post-implementation success.

6.1. Theoretical Implications

This study contributes significant implications in the ERP area of research as past studies discuss many critical factors, but this conducted gradually in fragmented mode. Previously TOE was used at the pre-implementation

phase and during the implementation phase of ERP, but this study applied TOE theory at the post-implementation stage of ERP. This study found that effective project management leads to the success of the ERP system at the post-implementation stage. External support also plays a critical role in the form of supplier and consultant help in case of any need to the organization. While past studies suggested that top management support ensures ERP implementation success, this study emphasizes the leadership involvement in the post-implementation phase of ERP which acts as a vital element for the success of ERP.

6.2. Practical Implications

This study has certain practical implications for the use of ERP system in the corporate sector to get the maximum benefit from ERP system to increase their performance.

First, in regard to the technical aspect, the organizations should establish a capable project management team to handle the ERP implementation process effectively. This is because ERP implementation process is so exhaustive as it is being deployed in all departments at one time. It will be better to take high performing employees from each department to establish a team which mobilizes the whole procedure inefficient manner.

Second, organizational perspective leaders should actively involve themselves in ERP implementation process. This is to keep all employees motivated as they know that leaders are also involved, and it will create positive impact and synergy among the organization which will lead the success of ERP system. However, many leaders fail to understand their roles at the post-implementation stage, they think IT personnel will be responsible at this stage.

Third in regard to the environmental aspect, the consultants and vendors play a crucial role in ERP post-implementation stage. Most organizations think vendors' responsibility is finished after ERP implementation and team has to carry on the operational activities. but in case of performance and success is concerned, external support from vendors or suppliers is very crucial to achieve long-term success of the ERP system.

7. Conclusion

7.1. Limitations and Future Research

Despite this study's several implications, it still has certain limitations. Its sample size is relatively small as the unit of analysis is organization and it is difficult to get a response from players of the industrial sector. Moreover, the cultural factor which may moderate the TOE aspects was not considered in this study of ERP post-implementation.

Hence, future research could consider these aspects. This study has extended the ERP studies from implementation to post-implementation stage by empirical analysis. In future research, it can further extend by doing qualitative research to explore more factors in the TOE theory and find operational and managerial benefits of ERP system at the post-implementation stage.

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