Critical Success Factors for ERP Implementation: The Case of Jordan

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Abstract: *ERP systems are complex systems that face high probability of failure. Implementing such systems need careful planning and guarding against factors for failure. This study tried to explore the major key success factors (KSFs) that will turn the implementation process to a success. The study utilized 60 responses from managers and executives of local Jordanian companies in a pursuit for the highest KSFs in the Jordanian environment. Results are reported with conclusions and future work at the end of this paper.*

1. Introduction

Leon proclaimed that *"ERP isn't going to take over the world because it already has"*, and this was in the year 2000, how about now [17]? During the past few decades, a high competitive business environment and the extensive evolution in information system technology have created a necessity for new systems that integrate all functions in and among organizations. Enterprise resource planning (ERP) systems, which emerged in the late 1980s and early 1990s, is a single application that can monitor all business functions. ERP system is an attractive solution especially for huge companies to get rid of all problems, where managers open a single application and easily find any information among all business functions [19].

ERP systems are too complicated to be assimilated and controlled within an organizational context. Recent literature reviews of this area emphasized the importance of understanding the implementation process and also propose diverse typologies of future research [25]. This study will try to explore how Jordanian firms perceive the diverse benefits of ERP systems. The following section will review the literature, followed by the context of the study and the data analysis, and finally end with the discussion and conclusion.

2. Literature Review

2.1. ERP System

In simple terms *"ERP systems are software packages that enable the integration of business processes throughout an organization"* [21, p. 294]. Enterprise Resource Planning (ERP) system is defined as "a single software system allowing the complete integration of information flow from all functional areas in companies by means of a single database and accessible through a unified interface and channel of communication" [23]. Also, Yazgan, Boran and Goztepe defined it as: "an integrated consulate enterprise wide information system that combines all necessary business functions like production planning, purchase, inventory control, sales, finance and human resource " [32].

Enterprise resource planning (ERP) is a system that uses computer technology in order to link various functions such as accounting, inventory control, finance, operations, supply chain, and human resources across an entire company. It is important to recognize the high cost of ERP implementation which requires complex processes and social interaction between departments and organizations [29]. ERP system is considered as one of the most important developments in the information technology (IT) corporations since the 1990s till present [29]. From the previous definitions, ERP system is intended to facilitate information sharing, business planning and decision making on an enterprise-wide basis, and it is also able to share the data from these processes with other corporate software systems.

2.2 ERP Implementation Cost

Organizations must realize the high cost of ERP implementation and assess if it is ready for such step [15]. ERP implementation requires a wide range of knowledge and external expertise; without external help it is really hard for any organization to be able to implement ERP successfully [22]. In addition to the previously mentioned costs, ERP implementation cots also include training of staff and the customization of the system to fit with existing firm interfaces [2].

In small to mid-sized companies, ERP implementation budget approximately ranges from $M2 to $M4. On the other hand, for large organizations it can exceed $M100. Furthermore, and after the implementation of ERP systems, where some

organizations gain many benefits and achieve some competitive advantage, others encounter costly failures. Also, because success requires an adaptation and alignment between IT and organizational environment, the implementation should be "fit" among all the contingent variables such as business processes, users' background, IT capabilities, and organizational culture [29].

Many ERP projects failed because ERP software is not properly implemented and caused serious consequences, high financial losses and many lead to bankruptcy. For instance, after two years of building its ERP system, Dell suffered a loss close to $M200 [31]. Also, Koh, Gunasekaran and Cooper reported that 40% of all ERP installations only achieve partial implementation and nearly 20% are scrapped as total failures [14]. Despite of all the significant benefits of ERP, there is a high failure rate expected to reach 60% to 90% [16]. Previous studies indicated that ERP implementation approximately requires between 1.5-6.0% of organization's annual revenue [13]. Research indicated that: in 2006 about 67% of companies spent more than $M1, and 13% of them spent more than $M20 on ERP systems [23]. The same authors proclaimed that such issue will have a compound effect since ERP projects never stop; after finishing the implementation, maintenance will start [23].

During the ERP life cycle, the associated costs can be categorized into the following: tangible costs and intangible costs. Tangible costs are easy to measure in monetary terms, while intangible costs are difficult to measure in monetary terms. Table 1 illustrates the various types of costs as reported by the authors.

Following an explanation of the ERP system life cycle phases as described by Merkuryev and Habil [20]: The first phase is the *adoption decision phase,* in which the manager decides to adopt the new system or reject this idea depending on the need for the system. The *acquisition phase* is the selection of an ERP system that fits with the organizational needs; this phase includes analyzing preliminary factors such as price, and may require help from external consultants. The third phase is the *implementation phase,* where customization is identified to fit the system with organizational needs. The *use and maintenance phase* is the fourth phase as the system should be maintained to ensure the usability, functionality and adequacy. Fifth is the *evolution phase*: in this phase new capabilities are integrated to ERP system to meet special requests and high level of customization; described as maturity phase because it provides and enhances the benefits of system. Finally, the *retirement phase,* it occurs when the system become unable to meet organizational needs because of the manifestation of new substitute technologies that meets firms needs.

Table 1. Costs of ERP Implementation Phases [20].

Phase	Tangible Costs	Intangible Costs
Adoption decision		Decision making costs
Acquisition	Consultancy Hardware Software licensing	Decision making costs Opportunity costs
Implementation	Consultancy Training Human Resources Systems' specification	Customization, conversion and data analysis, Time (dedicated by staff) Business Process Re-engineering
Use and maintenance	System reconfiguration System adaptation Costs of system failure	Indirect costs of system failure Lost competitiveness
Evolution	Costs of new applications	
Retirement		Opportunity costs Decision making costs

2.3. Critical success factors (CSFs)

In order to resolve this costly failure trap and maintain a success path in ERP implementation, many studies identified a set of critical success factors (CSFs) for ERP implementation. CSFs include top management support, vender's support, consultant's competence, users' support, IT capability, and project management leadership [29]. Similar to this study, Ustasüleyman and Percin concluded that project management, consultant planning activities and internal audit were significant in predicting the ERP implementation success [21].

On the other hand, successful system implementation needs explicit objectives as the first step, the second condition is embedding organizational and technology dimensions into information system, and finally, resolving practical problems in the road of successful implementation [7]. Another study by Somers and Nelson summed the challenges faced by firms throughout the implementation and utilization of ERP systems in a list called critical success factors (CSFs) and concluded that the highest among the 22 factors were: top management support, project team competency and interdepartmental cooperation. On the other hand, the least among all was the use of consultants [26]. The authors concluded to the factors that facilitate the success of ERP implementation and emphasized the early and careful preparation of the process and also securing commitment and cooperation from everyone. Finally, vender-outsourcing decisions need to be managed carefully as the authors recommend that delegating responsibility at the start of the project might be suitable, but at later stages the delegation of responsibilities should not be forwarded to venders.

Similar to the previous study, Hasibuan and Dantes explored 20 KSF of ERP implementation and related them to the ERP implementation stages [9]; the implementation stage and the most important KSF were as follows: communication factors in the project

preparation stage, package selection in the technology selection stage, change management in the project formulation stage, and finally user training in the implementation and development stage. Another study in the public sector domain grouped KSF into similar ones and according to the following typology: procurement procedure, government processes management, project team competence, and project management process [33].

Koh *et al.* studied the (CSFs) for ERP implementation; the result included: user training and external consultancy as significant key factors for successful ERP implementation [14]. Such result indicates improper user training and ignores external help that can lead to high failure rate. Users' involvement is also considered as an important factor for achieving successful ERP system as it reduces the potential of users' resistance for change [16]. Other issues that can inflect failure into the implementation process might be employee education and vendors' support [28].

Ke and Wei concluded that organizational culture is one of the main important factors that influence ERP implementation process; culture is highly dependent on leadership. Leadership means how to lead the whole organization [13]. Thereby, leadership plays a major role in defining organizational culture. ERP success is influenced by organizational culture; if organizational culture motivates employees to improve their skills and supports innovative ideas it will foster a successful adoption of ERP system. On the other hand, if the adoption of any new information system or technology, not necessarily ERP, conflicts with organizational culture, the result will be user resistance the change. The possible solution will be either modification this new system to correspond with existing culture or rejection this technology [13]. Lo, Tsai and Li concluded that a good selection of the software supplier will enhance the possibilities of successful implementation [18].

From users' perspectives, a study explored the influence of nine service-oriented related factors on the success of ERP systems and concluded that the most important three factors were: domain knowledge, communication, and attitude [6]. Such conclusion asserts the importance of technology adoption by users for the success of any new implemented system. Also, consultant participation inflected a positive influence on ERP implementation satisfaction through user training and IT staff skills, where its effect was found to be direct and indirect on satisfaction of users in an Iranian related study [27]. More research is emphasizing the importance of human resource factors more than other factors related to planning, implementation and stabilization of system [12].

2.4. Difficulties Facing of ERP Adoption

Our previous assertions indicated that ERP systems face a high probability to fail, escalate, and exceed its budgeted resources [13, 14, 16, 23, and 31]. Before starting an ERP implementation process, organizations should prepare a feasibility study of ERP adoption. Many problems may be encountered during ERP requirement elicitation phase such as: The problem of describing the requirements; the developer tries to develop the system according to users' needs, where users fail to clearly identify what they want. This could be described as communication problem [11]. Such phenomenon will result in users' dis-satisfaction of rejection of the system.

Research indicated that ERP systems do not provide the expected satisfaction specially when implementing systems like customer relationship management (CRM) and data warehousing [10]. The study concluded that human-related issues dominate the barriers to attaining the expected benefits of the system. Also, change management was a major cause of other issues that prevented the realization of ERP benefits. Sammon and Adam [24] identified a set of ERP implementation problem areas:

- Failure in accepting the *change*: one of the main potential problems that is expected to appear during ERP implementation phase, which is called (The Change problem).
- The *fit*: is another potential problem during the implementation phase, which indicates the failure of defining clear project objectives. Such problem will minimize performance level.
- The *actors*: failure in educating all employees about ERP project or preparing right and adequate resources for such important projects.
- The *plan*: failure in developing proper plan for operating and determining ERP budget.

However, this system might not satisfy managers' expectations as successful ERP software implementation is highly dependent on many costly processes like the continuous improvement of employees' skills and organizational knowledge, the acquisition of external experts and consultants, and the periodical maintenance [22]. Because ERP systems affect most of the departments in an organization, they tend to create changes in many business processes. Putting ERP in place thus requires new procedures, employee training, and both managerial and technical support. As a result, many companies found that the changeover to ERP is a slow and painful process. Once the implementation phase is completed, some businesses face trouble in quantifying the benefits that they gained from ERP.

2.5. Potential Benefits of ERP System

When ERP systems offer many potential benefits that pay off for the large investment in ERP systems. Using ERP systems can reduce time and total cost of operations. By default, ERP systems are assumed to provide the necessary information throughout the organization and even the supply chain to facilitate the decision making and organizational activities [30]. Organizations would benefit from such information sharing related to supply chain [1]. Organizations save money and time from ERP implementation in areas like: inventory size, order preparation time, standardization of production processes, customer order integration, standardization of human resource information, increasing product diversity, inventory delivery on time and effective coordination with supply chain [32]. The same authors assert that ERP improves the performance of business processes by controlling different departments and integrating theirs information flow into a single database accessible through a unified interface, which facilitates problem solving and improves decision making process. Similarly, Al-Dhaafri, Bin Yusoff and Al-Swidi proposed a model based on an extensive literature review that ERP will support organizational performance and excellence [3].

Previous studies indicated that competitive advantage is another significant benefit that ERP system provides for organizations that manage and operate ERP successfully [14, 16, 23, 29, and 32]. ERP systems have the ability to eliminate duplication of effort and data, improve processes, deal effectively with suppliers, increase productivity, facilitate corporate communication, gain customer satisfaction, and prepare for attending competitive markets for survival.

Another study indicated that the prior implementation of ERP system to the implementation of B2B applications will significantly increase the transactional benefits resulting from B2B [4]. The major causes of transactional cost benefits are related to communication and system's development. ERP system allowed companies to replace a network of complex computer applications with a single integrated system. For example, the same system could be used to forecast product demand, order the necessary raw materials, establish production schedules, track inventory, allocate costs, share information with other corporations, and estimate key financial measures.

A group of researchers categorized ERP outcomes into financial benefits (such as: reduction in operating, administrative and inventory costs), and non-financial benefits (reduction of data errors, facilitating information sharing, customer satisfaction and improving efficiency [5].

Ghazanfari, Rouhani, Jafari and Taghavifard [8] describe ERP systems as evolutionary and the peak point of information system in the modern decade. But the authors proclaim that there is a high failure risk during ERP implementation. Thus it is important to identify the critical factors that affect the success of ERP systems and the relationship between ERP and organizational performance. Many of the benefits realized in previous research have some type of influence on organizational performance. ERP system also supports business intelligence and helps manager in decision making processes [8].

3. Research Method

This paper is the first to explore the factors that influence the success and failure of ERP systems in Jordan. The sample used was 60 managers in 43 Jordanian firms where an instrument was developed and used to measure their perceptions in relation to the major success factors. Based on that, the study will try to answer two main questions:

- RQ1: What are the major factors that define the success of ERP systems?
- RQ2: And how they are ranked by Jordanian firms and experts?

The instrument used included some demographic data related to the respondent and the firm of respondents. The survey used was translated to Arabic to make it easy to all respondents to answer. The survey included 22 KSFs utilizing a 7 point Likert scale. The scale included a statement that rates each factor as least important to the success of ERP implementation (value = 1) or most important to the success of ERP implementation (value = 7).

The sample demographics are listed in Table 2, where the majority of respondents have a bachelor degree (86.7%), managers (56.7%), and come from four major types of industries: consultancy (31.7%), service (25%), manufacturing (20%) and educational (15%).

The means of the 22 KSFs were ranked from largest to least, where a mean of (1 - less than 3) is considered low; (3 - 5) is considered moderate; and (more than 5-7) is considered high. The results are shown in Table 3, where their original rank is not an indicator of their importance in the literature. The rank of Table 3 is according to the perceptions of Jordanian managers. The table shows that all factors proposed in this study are perceived as moderate and high. The highest KSF was top management support (mean=6.32), followed by user training on software (mean=6.08) and interdepartmental communication (mean=6.00). Where top management support was the most important KSF. On the other hand, the lowest KSF was partnership with vender (mean=4.40), preceded by architecture choices (mean=4.55), and use of consultants (mean = 4.85).

Table 2. Demographics of data.

Administrative Position	#	%
Chief Executive Officer (CEO)	12	20
Chief Information Officer CIO	12	20
Manager	34	56.7
Missing	2	3.3
Education	**#**	**%**
Bachelor degree	52	86.7
Master degree	4	6.7
PhD	0	0
Other	4	6.7
Industry type	**#**	**%**
Service	15	25
Manufacturing	12	20
Information Technology	1	1.7
Educational	9	15
Consultancy	19	31.7
Retailing	4	6.7
Other	0	0
Total number of firms		43
Total number of respondents		60

Table 3. The means and standard deviations of the list of KSFs.

#	Critical success factor (CSF)	Rank	Mean	Std. Dev.
1	Top management support	1	**6.32**	**1.06**
2	User training on software	2	**6.08**	1.29
4	Interdepartmental communication	3	**6.00**	1.26
3	Interdepartmental cooperation	4	5.98	1.28
7	Project team competence	5	5.88	**1.08**
14	Use of vendor's tools	6	5.83	1.21
13	Vender support	7	5.81	1.17
5	Project management process	8	5.78	**1.02**
6	Project champion	9	5.61	1.22
8	Change management	10	5.59	1.19
10	Clear goals and objectives of system	11	5.42	1.29
12	Careful package selection	12	5.41	1.41
20	Education on new business processes	13	5.39	1.54
11	Use of steering committee	14	5.25	1.41
21	Data analysis and conversion	15	5.19	1.67
18	Minimal customization	16	5.14	1.50
19	Business process reengineering	17	5.14	1.41
9	Management of expectations	18	5.12	1.43
22	Dedicated resources	19	5.00	1.50
15	Use of consultant	20	*4.85*	*1.86*
17	Architecture choices	21	*4.55*	*1.71*
16	Partnership with vendor	22	*4.40*	*1.83*

Looking into the values of standard deviations in Table 3, it looks like there is an agreement on the influence of "top management support" as a factor to guarantee the success of ERP implementation (Std. Dev. = 1.06, mean = 6.32). The low value of standard deviation indicates a low dispersion of data and a consensus on the mean. Other low values are illustrated for "Project management process" (Std. Dev. = 1.02, mean = 5.78) and "project team competence" (Std. Dev. = 1.08, mean = 5.88). On the other hand, the highest disputable factors influencing the success of ERP implementation are the last KSFs ranked by the mean values. The standard deviation values were high compared to the previously mentioned, where "Use of consultants" was the highest (Std. Dev. = 1.86, mean = 4.85), followed by "Partnership with vendor" (Std. Dev.

= 1.83, mean = 4.40), and lastly "Architecture choices" (Std. Dev. = 1.71, mean = 4.55).

Further exploration of data was conducted to see if a difference exists between the perceptions of different managerial levels and educational levels. A One Way ANOVA was conducted to compare the means of all KSFs of all managerial levels and educational levels. Results indicated no difference between the means in both cases and for all levels. Such result indicates that no need to conduct any further analysis.

4. Conclusions

This study explored different factors that will secure the success of ERP implementation. All factors projected in the literature were listed in a survey and distributed to executives and managers in the local Jordanian market. The results indicated an important role for top management support, user training on software, interdepartmental communication and cooperation, and project team competence. On the other hand, more controversial factors were listed at the bottom of the rank list as marginal influence on the ERP system implementation and they are: partnership with vendor, architecture choices and use of consultant. This study is the first in the Jordanian environment that utilizes a sample from the local market and addresses the perceptions of managers and executives. In this regard, a larger sample would increase the validity of this research and its findings. Also, more research in this area would enhance the instrument used and improve our understanding of the top factors influencing ERP success. Finally, results emphasize the important of top management support and involvement in the implementation process of this complex system.

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