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The Relative Importance of the Critical Success Factors of Enterprise Resource Planning System (ERP) in Jordanian Pharmaceutical Companies

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Abstract: This study aims through a theoretical framework to identify the critical factors that might help in the successful implementation of Enterprise Resource Planning systems (ERP) by covering the most important aspects of the success of implementing ERP systems. Many previous studies have identified many factors that help in the success of ERP systems. This study summarizes these factors and identifies the most frequently recurring factors by reviewing previous studies and composing a table showing the recurrence of these factors. Then surveying managers, heads of department and employees of IT departments in Jordanian companies for the production of human medicines for the relevancy and the importance of the extracted factors. About 15 Jordanian companies that produce medications were surveyed. This study shows that the following factors namely (team competencies and skills, minimal customization, top management support user training and education, project management, communication between sectors, teamwork and composition and skills, clear goals and objectives, business process reengineering, organizational change management user involvement and package selection) are the most important in the success of implementing enterprise resource planning systems.

Key words: Enterprise resource planning system, critical success factors, Jordan, pharmaceutical manufacturing, medicines, surveying

INTRODUCTION

The recent emergence of Information Systems (IS) which have been widely applied in organizations have witnessed significant growth because of its major impact on organizational profitability, success and sustainability. This impact is attributed to the development of information systems with multiple applications that helps in the sharing of knowledge among the departments in the organization and its functions.

ERP systems improve resource and process control and thus, improve all the processes within the organization. ERP systems are linked to a single system which is linked to a central database that provides access to data and information to its users within the organization at any time.

The main theme of the ERP application is not to build an application to achieve some of the goals but the possibility of building and implementing an integrated application covering all the operations of the organization through a single system interface. Most ERP suppliers are working, researching and developing ways to build these systems based on the best business practices. These systems address and automate all business operations in the world. The best-known vendors of these systems are Oracle, SAB, Microsoft and many others. In order to build ERP systems, there is a need to constructing the requirements for building systems that fit the organization. The organization business processes should also be compatible with the operations of the ERP system.

Current studies have shown that the planning for ERP systems by many organizations is of a higher concern than any other information system regardless of the organization's size. Since, the ERP systems have direct impact on the level of performance. On the other hand, the ERP systems are reducing the inventory cycle, speeding the completion of transactions, improving supply chain management, reducing costs, improving the financial situation of the organization and increasing productivity and much more.

But despite the many benefits of ERP systems which are too numerous to list and the direction that many organization are taking in the investment of applying ERP systems, there is a high level of failure in applying ERP systems in Jordan. There are many factors that help in the successful implementation of ERP systems and the avoidance of the failure and losses of the unsuccessful

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implementation of these systems. This high failure rate led to get more attention on the reasons behind these failures and the critical success factors that help in successfully investing in the ERP systems. This study aims at extract the main success factors that influence the success of ERP systems based on two stages; critically literature review from previous studies; after summarizing the most frequent factors. This study finds out the relative importance of the critical factors that help in the successful implementation of ERP systems in Jordanian companies for the pharmaceutical manufacturing by surveying 81 managers, heads of department and employees of IT departments in Jordanian companies for the production of human medicines. The importance of this study is highlighted by the identification of the factors that have the most impact on the successful implementation of ERP systems. The practical importance of this study is the results it will present to decision makers of Jordanian companies for the pharmaceutical manufacturing.

Literature review: Enterprise Resource Planning system (ERP) is a standard ready software application based on the best business practices that enables the organization to have integrated solutions to all functions and activities of the organization such as finance, procurement, human resources, customer relations, supply chain and financial asset management. The software is based on a centralized database accessible by users in accordance with the authority that is derived from the responsibilities and nature of the work they perform.

ERP systems: ERP systems are one of the innovative solutions that are adapted by large and small organizations that have a major impact on the improvement of production and increased efficiency, in addition to the integration of all the organization's activities.

EPR systems were built on the best business practices through a set of software and applications that meet all the functional needs of the organization. These systems are integrated to be more efficient depending on the various sources of information in the organization.

Many of the organizations around the world and especially in developing countries that have implemented ERP systems and did so to automate and improve processes and gain a competitive advantage. This has helped providers and systems developers to build these systems in a professional way to meet all the current requirements and potential future needs. Organizations in developing countries are late in adopting and fully implementing ERP systems compared to developed countries. Studies indicate that the reasons behind this imbalance between developed and developing countries in implementing ERP systems is limited capabilities and resources, weak management and the absence of IT experts in the implementation of the systems of developing countries.

Other studies indicate that the reason for the imbalance in adopting ERP systems by developed and developing countries is due to the economic situation, laws, government legislation, the lack of maturity of information technology and the lack of experience in the management of business operations in developing countries.

The critical success factors in K systems implementation: There are several factors that impact the successful implementation of ERP systems. Some of these factors are related to organizational factors. As indicated by Roldan *et al.* (2002), they found the main factors that have the most impact in the successful implementation of ERP systems are organizational culture, top management support, the participation of all the members of the organization in all phases of the planning and implementation process of this system in addition to the support of distributors and training.

In the similar vein, Woo (2007) through his applied studies on several organizations found that support of top management, teams, project management, change of processes, education, training and communications are the most critical factors in the success of implementing ERP systems.

Zhang *et al.* (2003) sorted the factors affecting the successful implementation of ERP systems into five categories the regulatory environment, the characteristics of people in the organization, technical matters, the commitment of suppliers and organizational influence. This study also indicated that the support of top management, re-engineering of business processes, effective project management, training and education, the sustainability of equipment and machines and accuracy of data are the most influential factors for successful implementation of ERP systems.

Zhou-Sivunen noted that there are four factors to consider in ERP implementation team work, training and education which should be given to managers and employees before adopting the system, in addition to personal resources, re-engineering processes and the seamless modification of systems. Almahdi *et al.* sorted the critical factors for the successful implementation of ERP systems into three groups: Strategic factors (senior

management commitment, clear vision, current system), personnel factors (education and training, involvement of staff, task forces, staff capabilities), organizational factors (efficient project management, process management, change management strategy, information technology maturity, computer culture, empowerment, organizational culture, communication). Table 1 shows the most frequent recurring factors related to the successful implementation of ERP systems, the data are from the above studies and reference 55 specialized studies on the topic of ERP applications.

In a study by Anjum *et al.* to determine the critical factors in the successful implementation of ERP systems. Anjum *et al.* confirmed that success of ERP systems depends on its implementation within a specified time and the availability of resource. Taking inn to account the customer's satisfaction, training and support of top management. Garg (2010), identified the critical success factors of ERP systems including the commitment of top management, project management, project selection, project team composition and training. Nah and Lau pointed out that there are ten critical factors that determine the success of ERP systems such as: support of top management, task forces, formation of business plans, vision and effective communication,management of projects and current systems, development of systems, assessing and correcting errors, effective decision making and effective training.

According to Jafari *et al.* (2006), ten key success factors were highlighted support for top management, clarity of goals and objectives, communication, project management, process reengineering, accuracy and integration of data, sustainability of equipment and machines, support of suppliers, education and training and the participation of employees.

The study by Kale *et al.* emphasized on the issues that should be taken into account and should be available before starting ERP applications. These issues were planning the sources of infrastructure, quality education on ERP systems, human resources planning, support from top management, appropriate training accompanied by commitment by the company to its most capable personnel and experienced in the implementation of ERP systems. A study by Jing and Qiu (2007) confirmed the following factors that are related to the successful implementation of ERP ystems making the right

Table 1: List of factors related to the successful implemention of ERP system

References	Top management support	Training and education	Project management	Communication	Team composition and skills	Clear Goals and objectives	Business process engineering	Change management	User involvement	Package selection	Vendor support	Competency	Project champion	Testing and troubleshooting	Minimal customization	Data analysis and conversion	Motivation system	Performance	Strategic planning	Legacy systems management	Organizational culture	Management of expectations
Akkermans and Helden (2002)	x		x			x				x	x		x									
Somers and Nelson (2001)	x	x			x	x	x				x			x	x							
Helo *et al.* (2008)		x	x	x				x		x										x		
Dezdar (2011)		x		x							x											
Dorobat and Nastase (2010)		x																				
Lemmetty *et al.* (2009)		x																				
Bueno and Salmeron (2008)		x		x					x													
Sharma and Yetton (2007)				x																		
Woo (2007)		x		x																		
Zornada (2005)		x																				
Umble *et al.* (2003)		x	x						x													
Mandal and Gunasekaran (2002)		x																				
Loh and Koh (2004)					x	x																
Grabski *et al.* (2000)					x																	
Somers and Nelson (2004)						x													x			
Mabert *et al.* (2003)							x															
Hong and Kim (2002)							x	x														
Xu *et al.* (2002)								x														
Wei and Wang (2004)										x												
Shehab *et al.* (2004)										x												
Upadhyay *et al.* (2011)											x	x									x	
Motwani *et al.* (2002)											x											
Holland *et al.* (1999)												x						x		x		
	34	31	28	22	19	19	16	16	13	14	11	6	4	3	3	3	2	2	2	2	2	2

Table 1: Continue

References	Top management support	Training and education	Project management	Communication	Team composition and skills	Clear goals and objectives	Business process reengineering	Change management	User involvement	Package selection	Vendor support	Competency	Project champion	Testing and troubleshooting	Minimal customization	Data analysis and conversion	Motivation system	Performance	Strategic planning	Legacy systems management	Organizational culture	Management of expectations
Mukti *et al.* (2012)	x	x	x	x	x			x		x												
Khattak *et al.* (2012)	x	x	x	x	x	x	x	x	x													
Zouaghi and Laghouag (2012)	x				x	x	x		x													
Annamalai and Ramayah (2013)	x	x	x	x	x	x	x	x	x		x	x				x						
Alaskari *et al.* (2012)	x																					
Dezdar and Sulaiman (2012)	x	x	x	x			x				x											
Schniederjans and Yadav (2013)	x	x	x	x	x			x		x				x								
Amalnick *et al.* (2011)	x	x	x	x			x	x														
Khadija and Elmezanemoutad (2011)	x	x	x		x				x													
Garg (2010)	x	x	x	x	x	x	x	x	x	x												
Mehrjerdi (2010)	x		x	x	x	x				x	x	x	x									x
Supramaniam	x	x	x	x	x	x	x			x												
Pabedinskaite (2009)	x	x	x	x	x	x	x	x	x													
Noudoostbeni *et al.* (2009)	x	x	x		x																	
Francoise *et al.* (2009)	x	x							x													
Dezdar and Sulaiman (2009)	x		x		x		x															
Franc *et al.*	x		x	x	x	x	x	x	x				x	x				x				
El-Sawah *et al.* (2008)	x		x						x	x	x										x	
Ngai *et al.* (2008)	x	x		x																		
Remus (2007)	x	x	x	x	x	x	x			x	x	x	x		x	x						x
Finney and Corbett (2007)	x	x	x	x		x		x		x							x					
Garcia-Sanchez and Perez-Bernal (2007)	x	x	x	x	x			x	x	x												
Jafari *et al.* (2006)	x	x	x	x		x	x		x													
Soja (2006)	x	x	x		x	x									x		x					
Woo (2007)	x	x	x					x														
Nah and Delgado (2006)	x		x	x	x	x		x		x												
Zhang *et al.* 2005)	x	x	x				x		x			x				x						
Yusuf *et al.* (2004)	x		x			x	x				x											
Umble *et al.* (2003)	x	x	x			x		x											x			
Al-Mashari *et al.* (2003)	x		x																			
Brown and Vessey (2003)	x							x														
Ang *et al.* (2002)	x																					

investment decisions, the participation of the various departments, appropriate support from suppliers and good training for the members of the organization. A study by Halata indicted that the following factors influence the successful implementation of ERP systems in small and medium-sized companies in Jordan compatibility between ERP processes and business processes, top management support, IT efficiency and engineering and support of suppliers/vendors of enterprise resource planning systems.

MATERIALS AND METHODS

This study seeks to find out the relative importance of the critical factors that help in the successful implementation of ERP systems in Jordanian companies for the production of human medications. This study started with literature review of previous studies to extract the most frequent factors, then surveying managers, heads of department and employees of IT departments in Jordanian companies for the production of human medicines for the relevancy and the importance of the extracted factors. Whereas the managers, heads of department and staff of IT departments in Jordanian companies for the production of human medicines that are registered as members of the Jordanian Union of Pharmaceutical Producers which were a total of 15 factories.

The sample included the entire study population. The questionnaire was distributed to 85 managers, heads of departments and employees of IT departments in Jordanian companies for the production of human medications that are registered members of the Jordanian Union of Pharmaceutical Producers and 81 questionnaires were returned.

RESULTS AND DISCUSSION

Based on the research problem, objectives and the type of study data, a Likert scale was used to measure the application levels of critical factors that help in the successful implementation of (ERP) Enterprise Resource Planning systems. The central tendency, dispersion of the mean and standard deviation were measured to find out the relative importance of each variable. As shown in Table 2, the five point Likert scale was chosen because it

is one of the most widely used measurement scale. In addition, the five point Likert scale is easy to use and to understand. However, to determine the degree of agreement, three levels were specified (high, medium, low), low level 1<2.33, middle-level 2.33-3.66 and high level of 3.67 and above.

In order to describe the characteristics study sample gender, age, educational level and years of experience in the use of ERP systems were analysed as depicted in Table 3. We note that the percentage of males (67.9%) is much higher than the percentage of females (32.1) which indicates that females were the minority of the sample. The second category (Age) shows that the majority of the respondents are between 30-50 years old. However, 88% of the respondents are well educated, since, they hold a bachelor degree and above. The majority of the respondents have long experience of which 48% have more than 10 years of experience. This confirms the efforts of the pharmaceutical companies in Jordan to recruit high qualified and well-educated human resources.

Table 4 shows that the calculation of averages for the most important factors in the implementation of ERP systems ranged from (2.81-4.25) with the highest mean being for the factor of "support from top management". This is consistent with Table 1 which showed this factor to be the most frequently recurring in many of the studies. The lowest mean was for the factor of "Monitoring and evaluation of performance". In general it should be noted that all the differences in factors were the degree of prevalence between the high and medium level. This indicates the importance of the factors mentioned in Table 1 in the success of applying the ERP systems in Jordanian pharmaceutical companies, despite their uneven order. The most important factors were changed between (Table 1-4).

According to the critically literature review for the previous studies as a result, the following are the most ten frequent factors on the successful implementation of ERP systems top management support user training and education, project management, communication between sectors, teamwork and composition and skills, clear goals and objectives, business process reengineering, organizational change management user involvement and package selection.

After summarizing the most frequent factors as depicted in Table 4, this study finds out the relative importance of the critical factors that help in the successful implementation of ERP systems in Jordanian companies from the point of view of the managers, heads of departments and employees of IT departments in Jordanian pharmaceutical companies.

Table 2: Five point Likert scale

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
5 grades	4 grades	3 grades	2 grades	1 grades

Table 3: Sample characteristics

Demographic variable/sections	Frequency	Percentage
Gender		
Male	55	67.9
Female	26	32.1
Age		
<30	30	37.0
30-50	41	51.0
More than 50	10	12.0
Academic qualifications		
Less than bachelor	10	12.0
Bachelor	38	47.0
Master	28	35.0
PhD	5	6.0
Experience		
<0 years	42	52.0
10-15 years	23	28.0
More than 15 years	16	20.0

The study found that Jordanian companies for the pharmaceutical manufacturing have the ability and capability to implement the ERP systems successfully as well as the ability to overcome the obstacles to the implementation of business resource planning systems. However, we will briefly discuss the top five CSFs in the following.

Top management support: By providing the necessary and needed resources and support in all its forms for the success of its implementation and achieving the vision of the organization.

Package selection: The selection of the package whether developed by the organization or purchased from the outside as long as it is within standards and for specific needs and with advanced knowledge on the integration of ERP systems with the existing systems and activities in the organization.

Communication between sectors: Communication is important for the implementation of the ERP systems. Having knowledge of the needs and expectations, the enhancing of official communication, receiving responses and announcements of progress and informing the staff about the changes that will occur and that is involved in the development process.

User training and education: The provision of adequate training of employees before the implementation of the new information system helps greatly in the following accepting the change, the success of the implementation of the new system, overcoming the difficulty of the implementation of the information system by users and the participation of end users.

Table 4: The arithmetical averages and standard deviations of the CSFs of ERP systems in Jordanian companies

Factors	SD	Mean	Degree of relevancy
Top management support	0.79	4.25	High
Package selection	0.78	4.23	High
Communication between sector	0.92	4.21	High
User training and education	0.91	4.19	High
Competencies	0.87	4.13	High
Change management	1.28	3.98	High
Project management	1.28	3.98	High
Team composition and skills	0.93	3.94	High
Clear goals and objectives	0.85	3.92	High
Minimal customization	1.14	3.88	High
User involvement	1.18	3.88	High
Business process reengineering	1.08	3.83	High
Vendor support	1.06	3.83	High
Organizational culture	1.34	3.79	High
Project champion	0.90	3.77	High
Testing and troubleshooting	0.87	3.58	Medium
Data analysis and conversion	1.07	2.81	Low
Motivation system	1.12	2.81	Low
Strategic IT planning	1.07	2.81	Low
Legacy systems management	1.12	2.81	Low
Management of expectations	1.07	2.81	Low
Monitoring and evaluation of performance	1.12	2.81	Low

Team capabilities and skills: It is a group of skills, knowledge and attitudes that appear in an employee's behaviour. Competencies are essential if employees want to perform better. It must always be kept in mind that the competencies required for each position differ from each other. These competencies include management competencies, communication competencies, supervisory competencies and knowledge competencies.

It should be noted that the 'Package Selection' factor and 'Team Composition and Skills' factors were not among the most important factors listed in Table 1, however, they appear to be among the ten important factors, according to the viewpoint of the managers and heads of department. Furthermore, 'Business Process Reengineering' and 'Organizational Culture' were among the ten most important factors according to the studies shown in Table 1 but were not among the ten important factors according to the viewpoint of the managers and heads of department.

CONCLUSION

In an effort to narrow these gaps in the literature, this study aimed to explore and incorporate a taxonomy of critical success factors of the Enterprise Resource Planning system (ERP) systems. To achieve this, the study established theory-based measures for the main concepts that were adopted in the literature. This task was concerned with reducing the bias. After that, we surveying IT departments in Jordanian production of human medications for the relevancy and the importance of the extracted factors. According to the respondents, the five most important factors were top management support, package selection, communication between sectors user training and education and team capabilities and skills.

RECOMMENDATIONS

The study recommends drawing attention to the establishment of ERP systems, in addition to the factors mentioned in Table 1, regarding the following issues Focus on adequate funding to ensure success. Focusing on the adequacy of user training on new systems, work procedures and their follow-up to ensure optimal use of the system.

When making a decision to adopt an ERP system, companies should have clear and written procedures, so that, the system that most closely matches the company's business processes is selected. To study the gap between the company's operations and the best practices in the system and to study the possibility of re-engineering the internal processes of the company in a manner that will commensurate with the system and adapts the work of the company before proceeding with the implementation of the ERP system.

Identify the problems that the company aspires to be rid of by installing the system. Determine the company's future vision and take it into consideration when choosing the right system. Choosing the appropriate system for the company or organization according to the nature of its work, size and potential. Provide strong support from the enterprise leadership to the project manager or applicant. Coordination between project partners and consultants. Provide qualified teams from the company to research with the consulting firm.

Participation of task forces in reviewing outputs and making observations. Work on upgrading the IT infrastructure to ensure that the organization's resource planning system is built on the best available standards in terms of ease of access to information, responsiveness of the system and to ensure continuity of research in the event of any problems.

Focus on developing the efficiency of the Information Technology Department team to ensure that technical services are provided in lieu of the other party for the implementation of the ERP system in the post implementation phase Surveying service provider's implementation of the ERP system with surveys that are dedicated to exploring their perspectives on factors influencing the success of the organization's resource planning system. Conduct studies focused on a specific organizational resource planning system and identifying the most successful sectors when applied.

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