The Critical Success Factors of ERP implementation in Higher Education in Saudi Arabia: A Case Study

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Abstract

An ERP system plays an important role in managing business processes. Recently, many universities have implemented ERP systems. However, little research has been conducted regarding these systems in the higher education sector. This paper explores and analyzes the existing literature on ERP implementation and attempts to identify the critical success factors for a successful implementation of an ERP in higher education's institutions in Saudi Arabia. We use Madar, which is an ERP system developed in King Saud University in Riyadh, Saudi Arabia, as a case study to measure the success in ERP implementation from technical and user perspectives. This paper proves that the most important critical success factors of ERP implementation in Higher Education sector in Saudi Arabia was project management. This study has contributed to academic research by producing the empirical evidence to support the theories of CSFs and ERP implementation success.

Keywords: ERP system, Madar, higher education institutions, critical success factors, Case study.

Introduction

One of the largest and most important areas of information systems implementation in organizations is enterprise resource planning (ERP) systems. ERP is the key businesses that help the organizations to gain a competitive advantage by integrating all business processes, managing and optimizing the resources available as highlighted in (Jing and Qiu, 2007; Noudoostbeni, Yasin and Jenatabadi, 2009).

(Xia et al. 2010; Jing and Qiu, 2007) define an ERP system as a commercial and configurable software package that manages and integrates of all the information flowing through the functional areas in the organization i.e. financial, accounting, supply chain and customer information, sales and distribution, production planning, materials management and human resources management.
Furthermore, (Xia et al., 2010; Upadhyay and Dan, 2008) define an ERP system as an information system consisting of software support modules where information is flowing between them and they share a central database. Some of these modules include utilities for marketing and sales, field service, product design and development, production and inventory control, procurement, distribution, industrial facilities management, process design and development, manufacturing, quality, human resources, finance and accounting, and information services. ERP combines business processes into one integrated solution. It is not just a software package but an efficient way of doing business.

ERP is not just an automation of the organization's business process; it provides an opportunity for the organization to re-engineer its business process to achieve its long term success. It provides several advantages such as improved process flow, reduced inventories, better data analysis, better customer service, better enterprise performance and higher efficiency. All of these attract organizations to adopt ERP systems to strongly enter the competitive market (Xia et al., 2010; Noudoostbeni, Yasin and Jenatabadi, 2009; Upadhyay and Dan, 2008; Jing and Qiu, 2007).

Upadhyay and Dan (2008) consider that the integrated nature and modular architecture of ERP makes it flexible for dynamically modifications and expansions. This provides opportunities for improving the original ERP system by integrating different enterprise systems with it. These systems include customer relationship management systems (CRM), Knowledge management systems (KM), and decision support systems’, such as the advanced planning and scheduling systems (APS) and the online analytical processing systems (OAP). Although of all that, still in practice, the procedure of ERP implementation is not only complex but also challenging, time-consuming, expensive, arduous task and resource intensive as agreed with most researchers as (Xia et al., 2010; Noudoostbeni, Yasin and Jenatabadi, 2009; Upadhyay and Dan, 2008; Jing and Qiu, 2007).

Many ERP implementation projects achieve limited success and the failure rate is high between 60% and 90% as researches (Xia et al., 2010; Al-Shamlan and Al-Mudimigh, 2011) found. Xia et al. (2010) referred that usually the high failure rate of ERP implementation come from the difference in interests between customer organizations that aim to provide the optimum solutions for business problems and ERP vendors who prefer a generic solution applicable to a broader market. Also, Many studies such as (Jing and Qiu, 2007; Al-Shamlan and Al-Mudimigh, 2011) indicated that the major reason for failure of ERP systems was the resistance of users to change or non-acceptance of new systems.

An ERP system is associated with massive and fundamental changes to organizational processes and affects the way that different stakeholders used to do their work. Therefore, an ERP system can be implemented successfully from a technical perspective but not from a user perspective.
So, the success may depend on users being willing to operate on the new ERP system as suggested by Al-Shamlan and Al-Mudimigh (2011). This increase the importance to measure the success of ERP system based on both technical and user perspective.

Recently, universities in Higher Education sector begin implementing ERP systems and start to adopt them to replace their old systems. Rico (2004) define an ERP system for universities as "an information technology solution that integrates and automates recruitment, admissions, financial aid, student records, and most academic and administrative services" (p.2). According to Abugabah and Sanzogni (2010), the differences between universities and organizations are apparent; universities use ERP systems for academic purposes but organizations use ERP systems for business purposes. Also, usually universities are governmental institutions do business for non-profit purposes. Furthermore, ERP is more critical in Higher Education sector because faculty, staff and students interact with major educational and administrative activities through ERP. Also, the high percentage of failure in ERP implementation is more in universities than organizations. This increase the importance to minimize the ERP failure in the Higher Education sector.

There are many reasons which attract universities to implement ERP systems including: global trends, growth in student numbers, competitive education environment, quality and performance requirements. These require the Higher Education sector to evolve and replace the existing management and administration systems with ERP systems which provide many management tools and facilities that guarantee the efficiency and accessibility for all users (Rabaa’i, 2009; Abugabah, 2010).

In the Higher Education sector, there is a rigorous need to explore the critical factors that lead to a successful implementation of an ERP system. There is a relatively little attention and researches that measures of ERP success or failure in this sector (Rabaa’i, Bandara and Gable, 2009).

This paper explores and analyzes the existing literature on ERP implementation and attempts to identify the critical success factors for a successful implementation of an ERP in higher education's institutions at Saudi Arabia by studying Madar which is an ERP system developed in king Saud University.

The paper is structured as follows. First, a literature review of ERP systems is introduced in general organizations and higher education institutions. Next, the critical success factors in ERP implementation are presented. Then, Madar case study background, methodology, and results and findings are given. Finally, a theoretical discussion and indications for further research are presented.
Literature Review

Organizations and companies in the business sector were the leading in implementing ERP systems. Many of them have implemented ERP systems. Recently, universities in the higher education sector begin implementing ERP systems and start to adopt them to replace their old systems. In order to have a thorough research on ERP systems, the literature review on implementing these systems has been conducted on both organizations in business sector and universities in Higher Education sector with a center of attention placed on the critical success or failure factors in ERP implementation. However, little research has been conducted regarding ERP implementation in the higher education sector and especially in Saudi Arabia.

ERP in General Organizations

Motwani, Subramanian and Gopalakrishna (2005) analyze a comparative case study of four firms that implemented an ERP. They identify the factors that facilitate success of ERP projects. As a result, they found that a cautious, evolutionary, bureaucratic implementation process backed with careful change management, network relationships, and cultural readiness can lead to successful ERP implementations.

Ngai and Wat (2008) present the common critical success factors (CSFs) for ERP implementation that are shared across 10 different countries/regions. Eighteen CSFs were identified with more than 80 sub-factors for the successful implementation of ERP. They found the most CSFs are as follows: appropriate business and IT legacy systems, business plan/vision/goals/justification, business process reengineering, change management culture and programme, communication, ERP teamwork and composition, monitoring and evaluation of performance, project champion, project management, software/system development, testing and troubleshooting, top management support, data management, ERP strategy and implementation methodology, ERP vendor, organizational characteristics, fit between ERP and business/process, national culture and country-related functional requirement.

Xia et al. (2010) present a proven and practical approach that addresses critical decisions for a successful ERP implementation in medium-sized enterprises. This paper defines roadmap for ERP implementation in four stages. These stages identified in the ERP project life cycle, which are: Readiness assessment, Business process reengineering, ERP package selection and Implementation. It also identifies eight success key factors in the readiness assessment stage which are as follows: powerful business case, vision clarity, change leadership and accountability, change specific communication, increased change capability, integrated planning and teams, stakeholder commitment, aligned performance and culture.
Noudoostbeni, Yasin and Jenatabadi (2009) show that the first 10 effective variables in the success of ERP in Malaysian small and medium enterprises as in order of the following: implementing team’s teamwork and composition, effective training of users, open and honest communication, Group structure, other departments’ participation, reasonable expectation with definite targets, top management involvement, cooperation between enterprise and software company, project management and effective decision-making. In their survey, project managers found three main reasons for the failure of all IT-related projects, which are as follows: (1) Poor planning or poor management (77%) (2) Change in business goals during the project (75%) (3) lack of business management support (73%).

Upadhyay and Dan (2008) study nineteen critical success factors in ERP implementation and extract the most important of them in Indian small and medium enterprises which are the following: clarity in goals and objectives behind the implementation, adequacy of user training, competency of the project implementation team, acceptance of changes brought about by the implementation and adequate vendor support and external consultant participation.

Jing and Qiu (2007) analyze the critical factors that influence ERP implementation based on the interpretative structural model and establish a multilevel stratum structure model for influential factors of implementing ERP that can be used to conduct pre-implementation analysis of ERP systems. The chosen CSFs are the following: top management involvement, department’s participation, funds support, cooperation between enterprise and Software Company, reasonable expectation with definite target, open and honest communication, training, group structure, project management, enterprise information management, outsider competition pressure, level and service of the supplier of ERP.

**ERP in Higher Education Institutions**

Rabaa’i, Bandara and Gable (2009) present a descriptive case study which provides many contextual details about ERP system selection, customization, integration and evaluation. Their case study conducted at Queensland University of Technology in Australia, to emphasis on ERP evaluation in Higher Education Institutions in the Australasian region.

Davis (2007) examines (SAP) which is an application of ERP software to the student information management in higher education at a Midwestern university. They also explore some critical success factors (CSF) for a successful ERP implementation such as planning and preparation, communication, training and user satisfaction. Their study revealed that user satisfaction is a critical part of the success of an ERP implementation.

Abugabah and Sanzogni (2010) gather the critical reviews about previous researches in ERP systems in higher education, with a special focus on higher education in Australian. Also, they show the difficulty in identifying the benefits of ERP systems in terms of their employees’
performance that is reflected in the outcomes and services of the organizations. Therefore, they try to capture the evaluation of ERP technology considering users and organization perspectives.

Laurits and Biniftech (2002) identify the critical success factors (CSF) for implementing an ERP system in a university environment on an Australian university. They developed theoretical framework comprises six broad factors: strategic factors, organizational context, ERP information quality, ERP system quality, ERP project scope and user satisfaction.

Rico (2004) show an overview and survey on ERPs in institutes of higher education sector. They examine the cost, technical, and customer risks of implementing ERP solutions at the University of Wisconsin-Superior, the University of Massachusetts, and the Wisconsin Technical College System.

Al-nafjan and Al-Mudimigh (2011) present a review of the research literature that focuses on the ERP change management factor. They present (Madar) case study demonstrating effective strategies in reducing uncertainty and perceived risk with individuals involved in the transition to new ERP systems, which in turn decreases –even though not completely eliminates- resistance to change.

Alghathbar (2008) explores implementing an ERP system at King Saud University (KSU) in Saudi Arabia. He highlights the positive factors required in implementing the ERP in an acceptable manner. Also, he describes various challenges encountered during implementation process.

Al-Shamlan and Al-Mudimigh (2011) investigate the effective and more useful change management strategies, and significant processes and tools for change management to implement successful ERP system. They take a successful enterprise system (MADAR) as a case study and they measure the impact of change management on employees.

Our study is designed to fill gaps in these current researches by providing a case study of ERP implementation in higher education in Saudi Arabia and measuring the success of this implementation based on both technical and user perspectives.

**ERP Critical Success Factors**

The Critical Success Factor (CSF) approach has been founded over the last 30 years by many researchers. The most important researcher was Rockart (1979) who defined the CSF as “the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization” (as cited in Amberg, Fischl and Wiener, 2007, p3). In ERP implementation, Gibson (1999) defined the CSFs as “factors needed to ensure a
successful ERP project” (as cited in Rasmy, Tharwat and Ashraf, 2005, p2). In order to choose the CSFs in this paper, we examine the frequently mentioned CSFs in the previous literature review especially at Ngai, Law, and Wat (2008) research, which provide all cited CSFs in different researches. As a result, chosen critical success factors are shown in Table 1 and Table 2.
Critical Success Factors (CSFs) | Meaning
--- | ---
Top management commitment and support | There is enough support from head engineering and commitment of resources
Change management | There is a structured approach to shifting/transitioning the university from a current state to the desired future state
Project management | Use of skills and knowledge in coordinating the scheduling and monitoring of defined activities to ensure that project objectives of are achieved
Business process reengineering and customization | There is some change in work process comes with implementing the ERP System
Training | There is effective training for users
ERP team composition | The team has technical personnel and manager.
Clarity vision/ goals & objectives | There is a clear picture of the future state
Consultant participation | There is participation of outsider/insider consultants in the ERP system.
Departments (Stakeholder) participation | There is participation and communication between different stakeholders in different departments and ERP team. So, ERP facilitate communication between departments and ensure the work operating continually.
ERP system selection | Selecting the appropriate ERP system that fit the needs
ERP systems integration | There is good Integration between systems involved in the ERP
Resources support | Support in finance, hardware and man power
Scope of implementation | The scope of ERP implementation is defined (has boundaries).
Choosing of the supplier & its support | Choosing based on stability and history of the supplier, the support they offer, the competence of the installers and the availability of third party additional products and potential for improvements to the selected ERP package
Outsider competition | Competition with other universities in KSU and world.

Table 1: The Critical Success Factors for technical prospective

<table>
<thead>
<tr>
<th>Category</th>
<th>CSFs</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>System usefulness</td>
<td>The degree in which a person believes that using a particular system would enhance his or her job performance</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td>There is effective system training for users. Training is in positive relationship with user satisfaction.</td>
</tr>
<tr>
<td>Organizational</td>
<td>User Participation</td>
<td>There is participation between different users and ERP team. User satisfaction is positively related to user participation.</td>
</tr>
</tbody>
</table>

Table 2: The Critical Success Factors from user prospective to measure user satisfaction

In order to choose the most influencing factors in Higher Education sector in Saudi Arabia, our case study was conducted in Madar as explained in next section.
Madar Case Study

Background

Saudi Arabia has the biggest IT market in the Gulf region, with a value of US$ 3.4bn in 2008 expected to rise to US$ 5.6bn by 2013 (Market Research Reports, 2009). Many local advantages in KSA can be utilized to achieve a leading position in e-business world. These include geographical location, free economic strategy, communication infrastructure, and population formation. Al-Otaibi and Al-Zahrani (2004) found that about 69% of organizations in KSA adopting different ERP packages as shown in figure 1.

![Figure 1: ERP Packages Adopting in Saudi Arabia](image)

The Saudi government has signed off on a US$ 3.1bn plan to improve the education system. In their plan, they focus on providing education institutions with the best scientific and technological activities. Furthermore, a separate allocation of SAR 2.4bn has been earmarked to pay for training for 400,000 teachers (Market Research Reports, 2009).

There are twenty four governmental universities at Saudi Arabia and twelve of them adopting ERP System (Wikipedia, 2011; Ministry of Higher Education, 2010). By contacting each university, we found that these twelve universities are as follows: King Saud university (KSU) (2007), King Fahd University of Petroleum & Minerals (2007), Qassim University (2007), Aljouf University (2008), Hail University (2010), King Abdullah University(2010) , King Saud Bin Abdulaziz University (2011), Taibah university (2011), Islamic University in Almadinah (2011), King AbdulAziz University in Jeddah (2011), King Faisal University (2011), Shaqra University (2011). Since 2007, universities in Saudi Arabia begin to adopt ERP systems and the number is increasing till now as shown in figure 2.
Figure 2: Number of universities in Saudi Arabia that are adopting ERP System

King Saud University (KSU) is one of the largest universities in Saudi Arabia. It has more than 22 colleges and 15 research centers at 10 locations across Saudi Arabia. There are two hospitals associated with KSU that support medical education to student. This big environment requires an ERP system that manages and controls different resources of KSU effectively and speedily. Therefore, KSU was one of the leading universities in implementing ERP system in Saudi Arabia. KSU is a governmental university that means that it is forced to follow governmental policies and spend within a limited budget. Because of budget constraints and shortage of skilled users, KSU decided to provide a local ERP package (Madar) that meets the budget constraints. This gives them a greater flexibility for customization with the Saudi governmental policies (Alghathbar, 2008).

In 2007, King Saud University (KSU) decided to implement ERP system called Madar. There are twelve targeted administrative systems in the new ERP system as the following: Financial system, Human Resource system, Payroll system, Administrative and Communications system, Inventory control system, Warehouse system, Employee Self Services portal, Purchasing system, Scholarship and training system, Budget and Planning system, Authorities and confidentiality system, and Pledges systems (Al-nafjan and Al-Mudimigh, 2011; Madar Project, 2009).

Methodology

This research was conducted using two questionnaires that were designed based on the chosen CSFs (ERP Critical Success Factors section). One of questionnaires was for staff who working in Madar system and the other one was for the end-users i.e. staff in the twelve targeted
administrative systems. Both of them were contacted via email inviting them to participate in the questionnaire. Some of the questionnaires were distributed as hard copies. The first questionnaire was designed to measure the CSFs from a technical prospective. The scaled used were a 5 Level Likert Scale (1=extremely satisfied, 5=extremely dissatisfied) and a Rating scale. The sampling was done on 8 people i.e. all Madar team members. In order to check which CSFs are more effective, sample t-test method was used, in which the null hypothesis $H_0: \mu<3$ and the alternative hypothesis $H_1: \mu\geq3$. The statistic test was

$$t = \frac{\bar{x} - 3}{s/\sqrt{n}}.$$

The second questionnaire was designed to measure user satisfaction i.e. the perceived acceptance of the ERP system. It was focused on factors effecting user satisfaction which were organized according to Chadhar and Rahmati (2004) into technical and organization categories as shown in table 2. The scaled used were a Guttman scale and a Rating scale. The data was collected from different Madar system users and it has been tested using the SPSS software.

A total of 130 questionnaires requests were distributed manually or sent out via email to Madar users on KSU. Response rates was 29% of 130 and these response are from different Madar sub-systems as shown in figures 3.

![Figure 3: Response Rate from different sub-systems in Madar](image)

**Results and Findings**

The results are presented in the following figures (Figures 4 and 5).
Figure 4: Success Factors by Degree of Importance in ERP Implementation from technical perspective

<table>
<thead>
<tr>
<th>Critical Success Factors (CSFs)</th>
<th>Mean</th>
<th>STD</th>
<th>t degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management commitment and support</td>
<td>4.6</td>
<td>0.7</td>
<td>6.18</td>
</tr>
<tr>
<td>Change management</td>
<td>3.9</td>
<td>0.6</td>
<td>3.86</td>
</tr>
<tr>
<td>Project management</td>
<td>4.8</td>
<td>0.5</td>
<td>10.69</td>
</tr>
<tr>
<td>Business process reengineering and customization</td>
<td>3.9</td>
<td>0.4</td>
<td>7.00</td>
</tr>
<tr>
<td>Training</td>
<td>4.4</td>
<td>1.1</td>
<td>3.67</td>
</tr>
<tr>
<td>ERP team composition</td>
<td>4.5</td>
<td>0.8</td>
<td>5.61</td>
</tr>
<tr>
<td>Clarity vision/ goals &amp; objectives</td>
<td>4.4</td>
<td>0.9</td>
<td>4.25</td>
</tr>
<tr>
<td>Consultant participation</td>
<td>4.1</td>
<td>0.6</td>
<td>4.97</td>
</tr>
<tr>
<td>Departments (Stakeholder) participation</td>
<td>4.5</td>
<td>0.5</td>
<td>7.94</td>
</tr>
<tr>
<td>ERP system selection</td>
<td>4.6</td>
<td>0.5</td>
<td>8.88</td>
</tr>
<tr>
<td>ERP systems integration</td>
<td>4.6</td>
<td>0.8</td>
<td>5.28</td>
</tr>
<tr>
<td>Resources support</td>
<td>3.4</td>
<td>1.00</td>
<td>3.42</td>
</tr>
<tr>
<td>Scope of implementation</td>
<td>4.3</td>
<td>0.7</td>
<td>5.00</td>
</tr>
<tr>
<td>Choosing of the supplier &amp; its support</td>
<td>4.4</td>
<td>0.7</td>
<td>5.23</td>
</tr>
<tr>
<td>Outsider competition</td>
<td>4</td>
<td>1.9</td>
<td>1.53</td>
</tr>
</tbody>
</table>

Table 3: Success Factors by Degree of Importance in ERP Implementation from technical perspective

According to the table 3 & figure 4, from the ERP technical point of view, the most important and meaningful success factor in ERP implementation in Higher Education Sector in Saudi
Arabia are 'Project Management' and 'ERP System Selection'. The other success factors in this research do not seem to have a significant effect on the ERP implementation. However, the first 10 effective CSFs of ERP implementation in Higher Education sector in Saudi Arabia as in order of the following:

(1) Project management
(2) ERP system selection
(3) Departments(Stakeholder) participation
(4) Business process reengineering and customization
(5) Top management commitment and support
(6) ERP team composition
(7) ERP systems integration
(8) Choosing of the supplier & its support
(9) Scope of implementation
(10) Consultant participation

Based on questionnaire results shown in figure 5, we found that the factors that the Madar team gave it the priority in each phase of implementing system was successful because 63% felt that the training offered from Madar was helpful. 53% said that they can participate and express their opinions about the system. 58% satisfied about the functions offered from the system and found that the system make their work easier.

The participants in both questionnaires were asked to estimate a percentage of the level of success achieved in ERP implementation (Madar). The results are shown in table 4.

<table>
<thead>
<tr>
<th>Group</th>
<th>Average Level of success</th>
</tr>
</thead>
<tbody>
<tr>
<td>technical's</td>
<td>86.63%</td>
</tr>
<tr>
<td>users</td>
<td>64%</td>
</tr>
</tbody>
</table>

| Table 4: Level of success of ERP implementation |

Lastly, the participants in first questionnaire were encouraged to include additional comments regarding their suggestion for improving ERP implementation. The following are quotes from those comments:

- "Suggest integration with all government departments"
- "Madar system is considered as the qualitative leap for the university."
- "Suggest more integration between these systems (purchasing, finance, payroll, inventory)"
Conclusion and Discussions

In this paper, we provide a very significant and explicit contribution to highlight the most important critical success factors of ERP implementation in Higher Education sector in Saudi Arabia. This research will add knowledge on ERP implementations in developing countries. Literature shows that the high failure rate in implementing ERPs even after spending huge amounts on them but still could not ensure success of their implementation. We take Madar, which is successful ERP system, as case study to see what the CSFs are has been achieved in ERP implementation. This case study gathered an overall view from ERP team members and users i.e. technical and user perspective. This study has contributed to academic research by producing the empirical evidence to support the theories of CSFs and ERP implementation success.

In future, we planned to expand our research to study more ERP systems and more user's opinions in different universities in Saudi Arabia.

Acknowledgment

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References


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