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ANALYZING AND IMPACTING ENTERPRISE RESOURCES PLANNING SYSTEM IMPLEMENTATION SUCCESS REQUIREMENTS IN (IRAQI CONSTRUCTION PROJECTS)

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Abstract

The idea of the current study to study the possibility of availability of requirements for the application of the system in the construction sector represented by three companies for construction in Babylon-Iraq and is in urgent need for such systems as the completion of such a project in the construction sector can achieve a qualitative leap, The aim of this study is to know the possibility of applying the system in three construction companies by identifying the availability of the requirements of the success of the administrative, technical, human and behavioural capabilities. The study also aimed to know the role of providing the requirements of the application of the system and the possibility of successful application of In the fields of organizational, technical and informational and developing a model for analysing the relationship between factors and indicators of success by add three of new critical Success Factors Innovation, Minimum cost, Customer satisfaction, also the impact on improving the performance of the sample of the three companies which fall within the geographical area of the province of Babylon and under the main hypotheses that were tested using the statistical system (SPSS) and the questionnaire Distributed to officials (managers of engineers, technical and administrative programmers). The questionnaire was sent to 1250 individuals, and the response rate was 80% in the three companies. Using a heptagon scale limited to (Strongly Agree to Strongly Disagree) dedicated to it the study came out with a number of conclusions, Availability of application requirements and successful implementation. Among the most prominent results obtained is that the three variables added in the developed study obtained the highest values in terms of influencing the benefits and implementation of the system, and these new variables are among the most critical success factors for the system.

Keywords: Customer satisfaction, ERP in Iraqi construction sector,
Innovation, New critical success factors (NCSF).

1. Introduction

ERP software is part of the information systems group, which works to achieve greater automation based on greater control on the one hand, and modernization and immediate presentation of information related to the activities and functions of business organizations on the other. This has been reflected positively in enhancing the competitive advantages and capabilities of the organizations. Project resource planning systems offer many benefits in the engineering construction industry. Many organizations are also aware of the benefits of implementing the system, but these institutions remain reluctant to adopt these systems due to the high costs, uncertainty, and risks [1].

In this paper, critical factors were identified and analysed that need to be discussed to ensure the system is successfully implemented in the construction sector by developing a model for analysing the relationship between factors and indicators of success. Factors related to the success or failure of the ERP systems have been identified. Indicators were given to evaluate the success of these systems. In addition, an information system success model was developed for the purpose of analysing the relationship between factors and indicators of success with the help of previous studies. In the end, recommendations were made for successful project resource planning Systems based on analysis, and the derived successful factors (three variables-minimum cost, customer satisfaction, innovation) helped managers and decision makers to improve work value by implementing project resource planning systems with high efficiency.

2. Research Methodology

2.1. The research problem

The main problem is that the construction process is less standardized in comparison Manufacturing, as all projects differ in terms of their owners, management, and different specifications as well.

The different factors of success or failure and their morale for implementing the ERP system in the construction sector than in the manufacturing sector.

2.2. The research objectives

This study identifies and analyzes critical factors that need to be considered to ensure successful ERP system implementation in the construction industry. First, this paper identifies the factors associated with the success and failure of ERP systems and provides indicators to evaluate the success of such systems. Then, the paper develops an information system success model to analyze the relationships between factors and success indicators. Finally, the paper provides recommendations for successful ERP systems based on the analysis and below important objectives

- Identification and analysis critical success factors (previous & new) to ensure the successful implementation of a system ERP in the construction sector.
- Identify factors related to the success or failure of the ERP system the project.
- Providing with indicators that evaluate the success of the system.
- Developing the model for analysing the relationship between factors and indicators of success.
- Assist managers and IT managers to make the best decision when discussing project resource planning systems for these organizations.

2.3. The research hypothesis

The first hypothesis: There is a significant correlation between all study variables with each other.

The second hypothesis: impact study (regression analysis)

- There is significant effect for each of the following independent variables (Outputs, Job, Image, Result, Compatibility, Reliability, Internal Support, Function, Consulting Support, minimum cost, and ease of use) the dependent variable has the perceived usefulness.
- There is a significant effect for (minimum cost, Perceived usefulness, and ease of use) on the dependent variable intended customer satisfaction.
- There is a significant effect for (Customer Satisfaction, innovation, and quality) on the dependent variable are system benefits.
- There is a significant effect for (minimum cost, customer satisfaction, internal support, support consultant, function) on the dependent variable of innovation.
- There is a significant effect for (internal support, support consultant, function) on the dependent variable quality.

2.4. The previous studies

This study was based on four models related to forming the conceptual model for ERP success which:

- Technology acceptance model.
- Information system success model [2] which includes indicators of success.
- Four success factors added [3].
- The model presented by Chung et al. [4] which included many independent, dependent, and intermediate variables.

2.5. The conceptual model for ERP success

Figure 1 indicates the conceptual model of ERP success proposed in the current study. The success of an ERP system is classified into two categories: Successful adoption of the system and successful implementation of the project resource planning system.

The hypotheses of the relational model of the relationship between the variables are based on the contribution of both theoretical and institutional backgrounds of Three basic dimensions related to success of ERP systems as the total variables were (16) variable, seven of which are related to the beneficiary, and four were taken from (TAM and Davis) which are quality of the outputs, work link, the image, the reliability of the result, and the other three variables include (compatibility, reliability of the system, and the ability to prepare reports) which are extracted from industry expert reviews, and all variables related to the beneficiary. It is assumed to have a positive effect on the tangible benefit directly. The model also discussed the success of ERP implementation based on baseline reviews of project management. And success factors related to project management .

It was proposed by Lucas and Spitler [5] and included in the model. The hypotheses of this paper are directly related to factors affecting the tangible benefit that leads to the success or failure of the system. In addition, it includes the project's

success as an additional success indicator that affects other indicators. The project success is assessed using the basic project management contents from (time, budget, quality, and scope). In this research, variables-New Critical Success Factor (NCSF- minimum cost, innovation, and customer satisfaction) were added to their importance in the success of the ERP system in Iraqi construction companies.

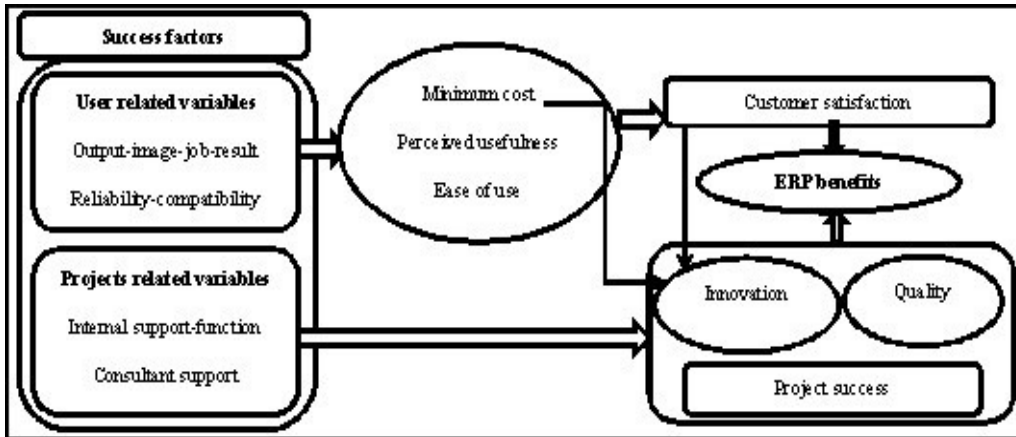


Fig. 1. ERP success model.

3. Literature Review

There are many challenges facing contracting companies regarding project schedules, safety, quality, and budget to meet the requirements. If the goal of these companies is to make the best decisions and maximize business goals and the ability to remain in the competitive environment, they must use the internal and external resources properly. The project resource planning system has recently been implemented by the largest companies, especially in the construction sector, as an integrated information technology solution as well as for the purpose of better integrating various business functions and resources, especially those related to project accounting.

Project resource planning systems are one of the important work techniques, and because there are no two similar systems in similar industries, the system focuses on information and synchronization unit, thus improving and coordinating operations and efficiency, reducing transportation costs, reducing cycle times, and improving response to customer needs [6]. Many major construction companies have realized the benefits of the project resource planning system but are reluctant to invest it due to the high costs and risks related to implementation, and these companies have adopted an approach that is the best of its kind, which is choosing and using separate software packages for each process instead of using complete packages [7].

Through specially designed interfaces, several units, such as human and financial resources, and accounts were selected from project resource planning system suppliers and combined with internally developed programs or third-party products [8]. Therefore, all the necessary business functions are grouped together in any integrated institutional system, and the reason for this is that construction processes are less standardized than manufacturing, as each project has a different owner, different work team and different conditions and therefore requires different

specifications. Therefore, the factors of success and failure in the construction industry differ from transformational and manufacturing industries [9, 10].

3.1. ERP system stages of work and its role in business engineering re-engineering.

It has four stages:

- Manufacturing Integration Stage (MRP). In 1970, directed media production systems were known as planning MRP Manufacturing Resources. The aim of MRP was to schedule and manufacture work orders and purchase orders. In the 1980s an extended version of MRPII was put in focus on other business jobs, including processing and manufacturing and distribution. Since its data and operations were not integrated with those. In other projects, MRP has been improved and renamed ERP II.
- Project Integration Phase (ERP II). In the mid-1990's, ERP became the second most recent MRP reinforcement, with Added "back office" functions like finance, warehousing and distribution functions quality control, human resource management, and integrated handling global business needs of retina foundation. The main goal of ERP was to facilitate Information exchange and integration. And provide solutions for a wide range of commercial operations. The aim of the integration was the use of technology to develop consolidation of processes across multiple business units for improvement efficiency and generate greater return on capital [11].
- Customer Resource Planning (CRP)The range of jobs in the ERP has expanded from the end of the 1990s. To include "front jobs", these are sales, marketing, and trade. E-commerce applications need to be in touch Backend systems, forcing ERP users to provide many Inventions like SAP and BAAN by focusing on the customer includes CRP operations with ERP and continuous planning instead from long and classic planning courses.

3.2. How to choose and implement an ERP system

This is done through the analysis and definition of success metrics, as follows:

- Analysis: Because the CSF is not understood, it must be well defined in a system that must be successful. So that these factors can be used to determine the critical requirements and whether these requirements are capable of achieving success or not [12].
- Determining success metrics: Before starting any project, you must first know - what is the measure of success for the purpose of saving money, increasing returns, increasing market share, since the effectiveness of success metrics is the driver the motivation for the working staff during implementation is that the focus and follow-up endeavors of the important activities of the project must be maintained [13].

3.3. The costs of using ERP

There are no fixed costs incurred by the company using the ERP system because those costs vary according to the size of the company and the number of users of the system. Therefore, costs can be determined as follows: -

- The costs of designing and implementing the software are the largest.
- The costs of the devices used in the company to operate the system depend on the number of devices and their accessories, the number of organizational units that make up the company, the work size, and the capacity of the company [14].
- The costs of training workers to use computer equipment, how to work on the system, and on new operations that need to be performed in order to properly implement the system.
- Integration and testing costs, which are invisible costs consisting of the costs of linking the company's subsidiary units to one database, as well as linking the company with other companies. The suppliers, and the necessary tests to ensure the validity of the information and the required modifications to the program.
- The costs of transferring data from old programs or records to the new program, which are costs neglected by many companies, despite the feeling of its importance with the start of entering data into the new system. From the above, companies should study well all the potential costs that might arise before starting ERP implementation [15, 16].

3.4. Applied Side

The description of each variable, including its abbreviated name and detailed explanation, can be found in Table 1. These abbreviated names will be used in all of the following analysis.

Table 1. Variables in ERP success model.

Variable	Abbreviated name	Describe	Number of items	Reliability α
Output	op	Measuring the quality of outputs, including management and performance reports KPI/CSF.	4	0.83
Job	job	The degree of an individual's perception of the level of congruence of the system with his function	2	0.90
Image	img	The extent to which the system enhances the individual's social image	2	0.85
Result	res	Perceptible use of the system, especially observation and ability to communicate	2	0.86
Compatibility	cop	System quality measure by sharing its data with other systems	2	0.90
Reliability	rel	The degree of assurance of data delivery by the system to users	3	0.85
Internal support	insu	Internal company support for senior management to implement ERP	3	0.90
Function	fun	The extent to which the system function matches the necessary functions of the company	4	0.88
Consultant support	cosu	The degree of assistance for consulting support to implement the system	2	0.88
Minimum cost	mc	Target of user is Reducing system costs as low as possible.	4	0.95
Perceived usefulness	pus	The degree to which a person believes that using a particular system would enhance job performance.	4	0.90

Ease of use	eou	A person's belief about using the system is that it is an effortless process	3	0.89
Customer Satisfaction	cs	The degree of user satisfaction with the system in terms of minimum cost and ease of use	4	0.97
ERP benefits	ben	User satisfaction with the system (individual and institutional) factors	7	0.92
Innovation	inv	Focus on the (minimum cost and customer satisfaction)	4	0.93
Quality	qu	The degree of quality of the system and the matching of its scope with the needs of the company	2	0.90

4. Data Analysis and Discussions

In this paper, there are three different dependent variables related with ERP success: minimum cost which leads to max perceived usefulness, customer satisfaction and project success/innovation which leads to max ERP benefits. This section investigates how the factors act together to affect these dependent variables using multiple regression analysis, Table 2. R^2 , which is the coefficient of determination, is interpreted as the proportion of variation in the dependent variable that potentially could be explained by the independent variable [17]. It is worth noting that the values refer to the standard regression coefficients, which help with equal comparison of the coefficient weights, as well as the values of b and the constant of the regression equation that help in measuring the expected value of the perceived benefit. Also, t values refer to a value of b divided by the standard error b , so it is important at the level of 0.05.

Table 2. Correlation matrix.

Var	Op	Job	Img	Res	Cop	Rel	Insu	Fun	Cosu	mc	pus	eou	cs	ben	inv	qu
Op	1															
Job	0.4	1														
Img	0.1	0.1	1													
Res	0.5	0.5	0	1												
Cop	0.3	0.2	0.1	0.4	1											
Rel	0.5	0.4	0	0.4	0.3	1										
Insu	0.5	0.3	0.1	0.5	0.2	0.5	1									
Fun	0.4	0.4	0	0.4	0.4	0.2	0.4	1								
Cosu	0.4	0.2	0.1	0.3	0.1	0.4	0.5	0.4	1							
mc	0.9	0.7	0.7	0.8	0.7	0.8	0.8	0.2	0.82	1						
pus	0.7	0.1	0.2	0.8	0.2	0.3	0.8	0.3	0.83	0.9	1					
eou	0.6	0.4	0	0.5	0.4	0.6	0.6	0.3	0.52	0.8	0.9	1				
cs	0.6	0.5	0.3	0.6	0.4	0.6	0.8	0.2	0.73	0.9	0.9	0.8	1			
ben	0.7	0.4	0.4	0.7	0.6	0.7	0.7	0.4	0.77	0.9	0.9	0.8	0.9	1		
inv	0.7	0.3	0.2	0.7	0.4	0.6	0.8	0.3	0.75	0.9	0.9	0.9	0.9	0.9	1	
qu	0.6	0.4	0.3	0.6	0.4	0.5	0.8	0.5	0.73	0.8	0.8	0.8	0.8	0.8	0.86	1

4.1. Benefits of ERP

Table 3 shows the results of a regression analysis of the benefits of the system that show both customer satisfaction and innovation and quality will have a positive correlation with the dependent variable. The benefits of ERP at the 0.05. To reduce the risks of implementing the system, focus must be placed on customer satisfaction.

Table 3. Regression on ERP benefits ($R^2=0.90$).

Variable	<i>b</i>	Standard Error	β	<i>t</i>	<i>sig</i>
constant	0.90	0.50	-	4.60	0.01
cs	0.88	0.03	0.58	12.57	0.00
inv	0.83	0.04	0.55	10.55	0.00
qu	0.80	0.02	0.21	7.30	0.00

4.2. Customer satisfaction

All three predictors had a significant relationship with customer satisfaction as initially expected as presented in Table 4. Including the minimum cost was a very important indicator for customer satisfaction and for the purpose of the success of the project resource planning system must focus on increasing the minimum cost of the system in order to adopt it as the ease of use and perceived benefit had a great correlation with customer satisfaction, directly and indirectly [2, 4] and quite well. For this reason, the minimum costs were included in the paper form as an indicator of customer satisfaction because they are linked at a level of 0.05 and it became mandatory for decision-makers to focus on the minimum costs.

Table 4. Regression analysis on customer satisfaction ($R^2=0.88$).

variable	<i>b</i>	Standard Error	β	<i>t</i>	<i>sig</i>
constant	0.87	0.50	-	4.57	0.00
mc	0.86	0.04	0.56	10.55	0.00
pus	0.82	0.05	0.50	8.45	0.00
eou	0.80	0.03	0.45	5.57	0.00

4.3. Implementation success- innovation

Innovation and quality of the ERP implementation project were the main indicators of ERP project success in this paper. Customer satisfaction & minimum cost are direct determinants of the innovation of the ERP project in the paper model, as shown in Table 5, and both had a significant related to it. This finding explaining in order to complete the ERP project on minimum cost and high customer satisfaction initially budget planned, internal support also top management commitment, good project planning, and training would be as well as high-quality consultant support. The fun is not an indicator of system innovation according to the regression analysis. the adjusted R^2 on this model is 0.85, which indicates that 85% of the variance in the innovation of the ERP project can be calculated for through these factors.

Table 5. Regression analysis a on innovation ($R^2=0.85$).

variable	<i>b</i>	Standard Error	β	<i>t</i>	<i>sig</i>
constant	0.84	0.47	-	4.39	0.70
mc	0.83	0.05	0.59	7.46	0.00
cs	0.85	0.04	0.62	9.45	0.00
insu	0.75	0.03	0.50	5.40	0.00
cosu	0.71	0.01	0.45	3.57	0.00
fun	-0.01	0.08	-0.01	-0.06	0.93

4.4. Implementation success-quality

Table 6 shows that internal and advisory support are important factors that explain the quality of the system at the 0.05 level. Both are important factors related to both the

success of adopting and implementing the system, and both are related to the benefits of ERP. Internal and consulting support has had a lot to do with innovation and quality. This result indicates the importance of their role in the successful implementation of resource planning. A must in decision makers. Firms choose the right consultant while thinking about implementing the ERP system. The job is not an indicator of the quality of the ERP system project according to the regression analysis.

Table 6. Regression analysis on quality ($R^2=0.82$).

variable	<i>b</i>	Standard Error	β	<i>t</i>	<i>sig</i>
constant	0.80	0.45	-	4.45	0.68
insu	0.85	0.03	0.70	9.55	0.00
cosu	0.80	0.04	0.65	6.58	0.00
fun	-0.02	0.06	-0.02	-0.33	0.71

4.5. The perceived usefulness

Based on the regression analysis on perceived usefulness (pus), as shown in Table 7, factors that have a significant effect at the 0.05 or higher level include mc, eou, insu, cosu, op and res. For example, R^2 of regression on pus was 0.80, indicating that approximately 80% of the variance in pus can be explained by the regression model. The main research result is that the new factor postulated in this study, mc was highly related to pus. This result can be interpreted as a suggestion that most users believe that if the costs of their ERP system is good enough to support their necessary business cost for system, they rate the system as useful. If one accepts the causal implications of the model, then defining the cost of the ERP system to match the user and business requirements are an important task in making the ERP system useful.

Another finding is that mc had a significant related to pus. costs were hypothesized to have an effect on both pus and cs are one of the biggest advantages of ERP systems, as formulated, eou, insu, cosu, op, and res had a significant related to pus. job had a marginal relation to pus. But it had a strong correlation with pus, its effect was not significant when included with other independent variables. Also, fun, system rel and img. Their correlations with pus were significant, but they had little related to the regression equation. cop may not be considered a predictor of the pus of the ERP project according to the regression analysis.

Table 7. Regression analysis on perceived usefulness ($R^2=0.80$).

Variable	<i>b</i>	Standard error	β	<i>t</i>	<i>sig</i>
constant	0.78	0.38	-	4.38	0.01
mc	0.88	0.08	0.80	9.55	0.00
eou	0.85	0.06	0.80	8.44	0.00
insu	0.83	0.06	0.80	8.23	0.00
cosu	0.80	0.05	0.79	6.57	0.00
op	0.75	0.05	0.70	5.35	0.00
res	0.67	0.04	0.60	4.64	0.01
fun	0.17	0.07	0.15	2.51	0.02
job	0.07	0.06	0.07	1.13	0.25
img	0.04	0.05	0.03	0.66	0.33
rel	0.03	0.04	0.02	0.72	0.32
cop	-0.02	0.03	-0.02	-0.86	0.74

5. Conclusion

This study is different from other research in the construction area in Iraq by added new three variables, (Minimum cost, Customer satisfaction and Innovation) among the most prominent results obtained is that the three variables added in the developed study obtained the highest values in terms of influencing the benefits and implementation of the system, and these new variables are among the most critical success factors for the system.

This study formulated the conceptual ERP success model based on background theories in the IS research area. The conceptual model adapted (TAM ,1986) the starting point for the structure of relationships between factors and indicators [2]. IS success model was used for identifying success indicators. in the end, The basic issues of project management were integrated into a model for analysing the project resource planning system and then working on evaluating this model through a survey or questionnaire by changing the factors associated with the dependent variables and that the focus of the research was on determining the success factors of the system through the two processes (implementation and user approval) and examining factors Determinants of System Success (Project and Use) These results helped companies in Iraq manage verification cases and reduce risks (implementation risks)and, Critical Success factors which are (Minimum Cost, Customer Satisfaction, and Innovation).

These factors, in turn, will positively and negatively affect the strategic objectives of the construction organizations in particular, the organizations in general, and the commitment of the higher management later.

Recommendations for Construction Companies

The more successful the ERP system, the more ERP benefits the company gain. that the main reason construction companies want to use ERP systems is to eliminate of costs from through improve efficiency and eliminate waste. The results show that mc, cs, inv and qu are related to ERP benefits. What encourages users to work with the ERP system? One answer is that the ERP system should be seen as useful, so decision makers should consider factors affecting usefulness to increase the chances of ERP success. Found that mc, cs, inv, qu ,eou, insu and cosu were highly related to benefits of ERP through the regression analysis. Based on this result, this paper provides recommendations to increase Benefit of the ERP system as it was found through the results of the research that minimum costs and ease of use have a great impact on achieving customer satisfaction, as well as innovation and quality have a very large impact in achieving the benefits of the overall project resource planning system.

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