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Project management factors affecting the enterprise resource planning projects' performance in Jordan

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Abstract

Purpose – This purpose of this research is to investigate the project management factors that are affecting the enterprise resource planning (ERP) projects' performance in Jordan. Based on the conducted literature review, four project management areas were selected for this research: the communication management, the human resource management, the time management and the risk management.

Design/methodology/approach – In total, 24 Jordanian ERP projects were surveyed through designing a questionnaire that was distributed to project managers. Moreover, interviews were conducted with both the project manager of the largest ERP project in Jordan and a consultant of one of the Big 5 consulting firms.

Findings – The interviews' results confirmed the effect of the four project management areas on the ERP project performance which is consistent with the questionnaire results except for the risk management.

Originality/value – No similar studies were found in Jordan. Moreover, this subject was tackled by only a few studies, so more research is recommended to investigate the project management factors that are affecting the ERP projects' performance. It is also recommended that future studies extend this research on factors other than project management factors.

Keywords Human resource management, Risk management, Project management, Time management, Communication management, ERP projects

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1. Introduction

Recently, enterprise resource planning (ERP) has become one of the most significant and sometimes very urgent needs for many business disciplines, even for the IT sector in which

it has been found that the development of any software suffers the challenge of managerial issues more than technical one (Beatty and Williams, 2006; Ara and Al-Mudimigh, 2011; Tingting and Kazuhiko, 2016). Thus, project management is an important requirement in implementing ERP systems and in achieving three challenging, competing and interrelated goals listed by Bhatti (2005) as scope, time and cost. These goals should be met from a project management perspective. The purpose of this research is to investigate the project management factors that affect the ERP projects' performance in Jordan.

Most previous studies were dedicated to key ERP implementation factors, including data accuracy, level of customization, top management support and team empowerment. These factors have recently received high attention in information technology (IT) projects. At the same time, there was lack of research on project management activities related to ERP projects, especially in the Middle East region. What distinguishes this study from the previous studies is that it focuses on four project management factors in Jordan and to what extent they affect the implementation of ERP in the chosen companies.

On the other hand, the uniqueness of the Middle East region plays a significant role in differentiating this study from others, as Jordanian companies – along with other companies in the region, which are implementing ERP projects – have started to recognize the importance of investing in IT and in automating their major processes, giving momentum to this study for justifying – or maybe not – these investments.

Jordan was chosen because this country, like other developing countries, is a middle-income country with limited natural resources Moreover, it faces serious challenges in IT projects, especially ERP projects.

This study starts by investigating project management factors affecting ERP projects based on the conducted literature review and ends with an analysis and investigation of these factors on ERP projects in Jordan.

2. Literature review

2.1 Enterprise resource planning projects in developing countries

What makes the projects that implements ERP different from others is the method of implementing the project processes in many areas including the scale, complexity, users' participation and cost (Ziemba and Oblak, 2013). Furthermore, ERP projects' implementations are complex and risky; the risks in such projects can be mitigated through many ways such as communicating with and involving stakeholders, as well as good project management; the most important point to be considered includes the barriers in communication channels through implementing projects, as it can limit the development of knowledge and make it difficult to develop ERP projects, because of the gap between the needs of the stakeholders and what is available in the organizations (Bearing Point, 2004; Andersson, 2016). Ram *et al.* (2013) has found that perceived system quality is a critical antecedent for ERP implementation to guarantee the desired quality and achieve goals.

It is necessary to study ERP implementation in developing countries, especially that most ERP studies are related to developed countries. These countries are trying to change their traditional information systems to new information systems like management information system and ERP, so their expenditure on the ERP is growing; however, the failure rates continue to block the delivery of ERP benefits. Moreover, the developing countries have their unique implementation challenges (Kamhawi, 2008; Hawari and Heeks, 2010; Moohebat *et al.*, 2011; Amid *et al.*, 2012).

2.2 Enterprise resource planning projects and project management

Four project management areas that can have major effects on the ERP project performance, namely, communication management, human resource management, time management and risk management, were selected.

Communication mechanisms are crucial for organizing project tasks issues and planning the coordination between the manager and the team (Wiklund *et al.*, 2003; Erik and Clifford, 2011; Andersson, 2016).

The communication plan helps to keep and disseminate communication channels through implementing projects (Evangelia *et al.*, 2012) and is considered a part of the overall plan (Erik and Clifford, 2011).

Erik and Clifford (2011) mentioned in their book the following core questions that project communication plans might answer:

Q1. The information that needs to be collected and communicated.

Q2. When this information should be collected and communicated.

Q3. The receivers of the information.

Q4. The methods for gathering, storing and communicating information.

Q5. The information access limitations.

As it creates a path for sharing the required information through the employees from several functional and technical areas so they can collaborate and work together, communication is considered one of the most important factors in ERP implementation projects (Gyampah and Salam, 2004, Mohammad, 2010). Thus, communication is critical to ERP implementation, and it is a major factor for gaining approval, for getting the buy-in and for understanding the ERP system (Kraemmer *et al.*, 2003).

On the other hand, human resource management, as defined by William (2008), includes all aspects of managing the project teams that are working together on a project.

It was found that there is a strong relationship between the team members' qualifications and how the team is composed and the success of implementing ERP, so hiring qualified employees is very important to provide the project with the required individuals who are suitable for the project (Carol and John, 1999; Dezdar and Ainin, 2011).

A major part of human resource management is monitoring and tracking of allocating resources and the ongoing task during a project, especially if any overloaded team member may be less motivated to give the best performance in the work (William, 2008).

Amid *et al.* (2012) and Ziemba and Oblak (2013) clarify the importance of the project team competence and dedicated resources. Also, Altuwaijri and Khorsheed (2012) and Nah and Delgado (2006) concentrated in their research on the team composition and teamwork which are all under the human resource management umbrella.

The time management also has a large share of the literature related to ERP projects. The average time for ERP system implementation is between six months and two years (Davide *et al.*, 2007).

Time management can be defined as the needed processes to manage the project in a way that guarantees completion on time (Project Management Institute, 2008).

Another definition for time management includes all aspects of managing the time components of a certain project, such as an activity estimating what is considered a difficult component of a project to manage because, many times, these estimates are pessimistic (best guesses by the concerned people); moreover, time management also includes schedule development and even resources' schedule management (William, 2008). To achieve ERP project success from the time management perspective, the management should focus on project-scheduling activities and the deliverable dates as critical factors in ERP projects (Nah *et al.*, 2003; Amid *et al.*, 2012; Altuwaijri and Khorsheed, 2012; Christofi *et al.*, 2013; Ziemba and Oblak, 2013).

Planned implementation of risk management procedures is a key factor for ensure that projects are on time and on budget while fulfilling all requirements at the same time (Paivi, 2009).

Project risk management, as defined by Project Management Institute (2008), includes the processes related to risk management, such as identification, risk and response planning, tracking and controlling risks […], etc. Risk management is very important in ERP projects, although it is excluded by the ERP project leaders as mentioned by Protiviti Risk and Business Consulting (2011).

Several researches have attempted to identify and classify the risks. One of the classifications for an ERP project includes: technological risks, organizational risks, business-related risks, managerial risks and financial risks (Poba-Nzaou *et al.*, 2008).

Henri *et al.* (1993) considered measuring the risks of an ERP project as an important part of risk management and the project manager should adopt a formal method of assessing risks. On the other hand, Ziemba and Oblak (2013), Davide *et al.* (2012) and Amid *et al.* (2012) also focus on the risk management area. The four project management knowledge areas (communication, human resource, time and risk) will be investigated in this research regarding their contribution to the success of Jordanian ERP projects.

2.3 Project management performance indicators

Project management has an important role in determining and planning the direction of a project, and it also ensures that the ERP project can be implemented on time, on budget and can meet the requirements of the organization (Bernard and David, 2003). Therefore, clear strategy, vision and plan should be determined to know in which way the project should be steered (Holland and Light, 1999).

The created plan should clearly clarify how the desired goals can be achieved. In project management, there are three often interrelated and competing goals that should be met: scope, time and cost (Bhatti, 2005).

Projects are always evaluated based on the achievement of specific goals, namely, scope, cost and time spent. So a higher degree of accountability of these triple constraints is considered as one of the primary functions of project management, which means balancing the tradeoffs between time, cost and performance while eventually satisfying the customers (Erik and Clifford, 2011).

The project manager should take into consideration the realistic nature of these triple constraints. For example, if the timelines are very tight and the project scope is very large, it will be difficult to reach the expected and desired result. As a result, the project manager constantly makes tradeoff decisions among these three constraints in all projects, large and small, IT or non-IT, as there are always limits on these golden constraints: time, cost and scope (Stephan *et al.*, 2010; Charlie *et al.*, 2009).

3. Research model

The main objective of this research is to evaluate the effect of the four project management factors (communication management, human resource management, time management and the risk management) on the ERP project performance in Jordan. Figure 1 shows the research model based on the literature review result:

Accordingly, the research will test the following hypotheses:

H1. There is no significant effect of project management knowledge area on ERP project performance.

H1.1. There is no significant effect of communication management on ERP project performance.

H1.1.1. There is no significant effect of communication management on completing the project on budget.

H1.1.2. There is no significant effect of communication management on completing the project on time.

H1.1.3. There is no significant effect of communication management on completing the project based on the requested specification.

H1.2. There is no significant effect of human resource management on the ERP project performance.

H1.2.1. There is no significant effect of human resource management on completing the project on budget.

H1.2.2. There is no significant effect of human resource management on completing the project on time.

H12.3. There is no significant effect of human resource management on completing the project based on the requested specification.

H1.3. There is no significant effect of time management on ERP project performance.

H1.3.1. There is no significant effect of time management on completing the project on budget.

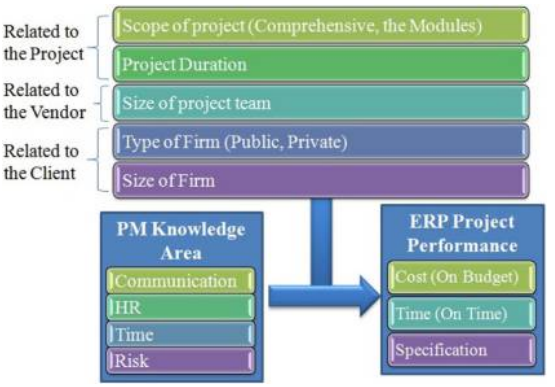

Figure 1.
Research model

H1.3.2. There is no significant effect of time management on completing the project on time.

H1.3.3. There is no significant effect of time management on completing the project based on requested specification.

H1.4. There is no significant effect of risk management on ERP project performance.

H1.4.1. There is no significant effect of risk management on completing the project on budget.

H1.4.2. There is no significant effect of risk management on completing the project on time.

H1.4.3. There is no significant effect of risk management on completing the project based on requested specification.

H2. There is no significant effect on ERP project performance because of the implemented modules.

H3. There is no significant effect on ERP project performance because of the duration of the project.

H4. There is no significant effect on ERP project performance because of the size of the project team.

H5. There is no significant effect on ERP project performance because of the type of the firm that the ERP is implemented on.

H6. There is no significant effect on ERP project performance because of the size of the firm that the ERP is implemented on.

Definition of variables: The ERP implementation project performance (time, budget and specifications) is the dependent variable, and communication management, human resource management, time management and risk management activities are the independent variables.

3.1 Methodology of the study

3.1.1 Population and sample of the study. The population of the study comprises all ERP projects implemented in Jordan. Because there are no official sources to obtain the number of ERP projects in Jordan, we referred to (Kinz, 2014):

> Kinz is a firm that specializes in companies' data mining and focuses on building databases to serve different sectors of Jordanian economy. Kinz provides their customers with detailed business information in the kingdom.

According to Kinz, a list of firms implementing ERP projects is not available, as it includes detailed information. In addition, it cannot be found in their databases, so the researchers followed the following steps to identify the number of firms providing ERP solutions, and based on this information, the number of projects can be defined:

- Table I provided a list of the IT companies that provide software solutions in Jordan and the number of their employees.

- These firms have been filtered by removing the companies with employee size between 1-25 employees, as the small companies cannot afford the implementation of large ERP projects.
- Then the website of each company has been accessed to check whether they provide ERP solutions. Finally, it was found that 13 companies provide ERP solutions, but two did not implement ERP in Jordan.
- The researchers succeeded in contacting 8 of the 11 companies to check the numbers of ERP projects that have been implemented in Jordan; these 8 companies have 24 ERP projects in Jordan.

The sample of the study consists of the entire defined population of 24 ERP projects. This study is concerned with the project management perspectives which are represented by the project manager of each project.

3.1.2 Tools of the study. To study the effect of the dependent variables on the independent variables:

- A questionnaire based on Likert scales has been designed to measure the effect of project management knowledge areas (independent variables) on ERP project performance (dependent variables).
- Interviews sessions have been conducted.

3.1.3 Data analysis. Descriptive statistics such as means, standard deviations and percentages, as well as regression analysis, are used to test the hypotheses.

3.2 The questionnaire

The researchers used a five-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree and strongly agree) to indicate the respondents' level of agreement with the given questions. The questionnaire form includes the following three sections:

(1) *The first section* includes general information: scope of the project, project duration, size of project team, type of firm and size of firm.

(2) *The second section* includes the project management knowledge areas that are supposed to be measured. The respondents were asked to give their opinion to what extent these areas were implemented in their projects; the researcher used the project management process groups mentioned in the *Guide to the Project Management Body of Knowledge* (Project Management Institute, 2008) to measure the level of implementation of each of the following knowledge areas:

Table I.
The employee size in the IT companies

No. of companies	Employee size
55	1–4
121	5–10
85	11–25
25	26–50
14	51–100
8	101–250
1	251–500

- communication (Questions from 1 to 11);
- human resource (Questions from 12 to 19);
- time (Questions from 20 to 26); and
- risk (Questions from 27 to 33).

(3) *The third section* includes the ERP project performance parameters, where respondents were asked to what extent they agree or disagree that these parameters have been achieved successfully.

- cost (on budget) (Questions from 34 to 35);
- time (on time) (Questions from 36 to 38); and
- specification (Questions from 39 to 44).

Appendix (1) shows the questionnaire template.

3.2.1 Variables' definitions.

(1) Independent variables

- *Project communications management*: This "includes the processes needed to generate, collect, distribute, store, retrieve and the ultimate disposition of project information in an appropriate and timely manner (Project Management Institute, 2008).
- *Project human resource management*: This includes the processes required to manage, organize and lead the project team (Project Management Institute, 2008).
- *Project time management*: This includes the processes required to complete the project on time (Project Management Institute, 2008).
- *Project risk management*: This includes the processes related to the risk management such as planning, identification, response planning and control the project risks […], etc. (Project Management Institute, 2008).

(2) Dependent variables

The triple constraint (projects that are completed on time, within budget and meet the specifications) is used to measure the project success (Duggal, 2010).

(3) Moderating variables

- *Scope of project*: The ERP modules include those for product planning, material purchasing, inventory control, distribution, accounting, marketing, finance and human resource. The number of the implemented modules may complicate the project.
- *Project duration*: The unrealistic durations may affect the success of a project.
- *Size of project team*: It is very important to have the needed number of members in the team to implement the plan on time.
- *Type of firm*: The environment of the firm that will implement the ERP system may affect the success of the project, as they are the business owners and they are the users of the system.
- *Size of firm*: The larger firm may need more time and effort than the small one.

3.2.2 Questionnaire validity. Validity is "The ability of a scale or a measuring instrument to measure what it is intended to measure" (Zikmund, 2003, p. 302). To ensure the research validity, the necessary modifications and updates have been done on the questionnaire after it was judged by a number of specialized experts in the in the IT, management and the engineering fields. The questionnaire has been reviewed by a group of experts from both academia and project management profession.

3.2.3 Questionnaire reliability. Reliability is " The degree to which measures are free from error and therefore yield consistent results" (Zikmund, 2003, p. 300). Reliability was measured by calculating Cronbach's alpha, and it was noticed that all alphas are acceptable. Table II shows the Cronbach alpha values

4. Research results

This section shows the results and recommendations of the study after investigating the research hypotheses.

4.1 Demographic analysis

The data show that 79.2 per cent of the ERP modules implemented are financial modules, and 41.7 per cent of the teams implementing ERP ranged between 10 and 5 members in size. The durations of 41.7 per cent were between three months to less than one year.

Most of the firms implementing ERP projects were private (70.8 per cent) and 66.7 per cent of these firms have over 250 employees. Table III indicates the distribution of study sample:

4.2 Description and analysis of the study variables

Ordinal scale of approval has been developed, using the following formula:

The maximum limit (Strongly Agree [5]) – the minimum limit (Strongly disagree [1])/the number of measurements required 3. Then 1.33 was added to the result at the end of each scale. The scales were distributed as follows:

(1) *High degree of approval*: This includes paragraphs that have the mean averages greater than 3.66 and the largest percentage at 73.2 per cent.

(2) *Medium degree of approval*: This includes a set of paragraphs which have the mean of 2.34-3.66 and percentage between 46.8-73.2 per cent.

(3) *Low degree of approval*: This includes paragraphs that have mean averages less than 2.34 and percentage less than 46.8 per cent.

Table II. Cronbach's alpha values

Dimension	Cronbach's alpha value (%)
Project communication management	93.0
Project human resource management	90.2
Project time management	87.0
Project risk management	87.0
Project management factors	*89.0*
Cost	93.0
Time	91.2
Specification	93.0
ERP project performance	*88.2*

Question	The implemented modules	Frequency	%
The implemented modules	Product planning	5	20.8
	Material purchasing	12	50.0
	Finance	19	79.2
	Inventory control	20	83.3
	Human resource	18	75.0
	Distribution	5	20.8
	Accounting	11	45.8
	Marketing	4	16.7
	Other modules	11	45.8
Project duration	less than 3	1	4.2
	3 to less than 12	10	41.7
	12 to less than 24	4	16.7
	24 to less than 36	6	25
	36 and more	3	12.5
Size of project team	Less than 5	5	20.8
	5 to less than 10	10	41.7
	10 to less than 15	3	12.5
	15 and more	6	25
Type of firm	Private	17	70.8
	Public	7	29.2
Size of firm	Less than 30	1	4.2
	50 to less than 100	2	8.3
	100 to less than 250	5	20.8
	250 and more	16	66.7
	Total	*24*	*100*

Table III.
The distribution of study sample

The mean of the "project management factors" as shown in Table IV is 3.5 which has a medium degree of approval. This is also the case with the "ERP project performance" which has the mean of 3.31.

Tables V and VI show the breakdown of the previous results presented in Table IV: As shown in Table V:

(1) The means' range for the communication management was from 3.13 to 4.33. The highest mean was for the item "All the stakeholders have been identified

Paragraphs	Mean	SD	%	Degree
Project communication management	3.79	0.650	75.8	High
Project human resource management	3.48	0.704	69.7	Medium
Project time management	3.60	0.550	71.9	Medium
Project risk management	3.14	0.996	62.9	Medium
Project management factors	3.50	0.591	70.1	Medium
Cost	2.94	1.313	58.8	Medium
Time	3.10	1.042	61.9	Medium
Specification	3.91	0.804	78.2	High
ERP project performance	3.31	0.932	66.3	Medium

Table IV.
The relative importance of the mean

Questions' briefs	μ	σ	%	Degree
All the stakeholders have been identified	4.33	0.76	86.6	
A project charter has been created	4.08	1.28	81.6	
Stakeholder analysis has been conducted	4	0.89	80	
Minutes of meetings are always taken and distributed	4	0.98	80	
Progress meetings were always conducted	3.88	1.19	77.6	
The stakeholders' feedback is taken into consideration	3.83	0.96	76.6	
The needed information was communicated	3.75	0.94	75	
A communication plan has been created	3.67	1.05	73.4	High
Progress reports were always submitted by the team	3.63	1.06	72.6	
The team has implemented the project communication plan	3.38	1.01	67.6	
The communication plan was always updated	3.13	0.95	62.6	Medium
Project communication management	*3.79*	*0.65*	*75.8*	*High*
There were clear roles and responsibilities	4.04	0.91	80.8	
The required training and development were conducted	3.79	0.98	75.8	
There were enough staff with the required skills in the project	3.75	1.07	75	High
The project team is loyal and active in the project	3.63	1.10	72.6	
Team building activities were conducted when needed	3.46	0.93	69.2	
The conflicts between the project team members were always resolved	3.13	1.26	62.6	
Human resource plan has been created	3.08	1.34	61.6	
A successful incentives system was implemented	3	1.25	60	Medium
Project Human Resource Management	*3.48*	*0.70*	*69.7*	*Medium*
All the activities in the project have been defined	4.25	0.44	85	
The activities dependencies were defined correctly	4.17	0.63	83.4	
The critical path(s) are always monitored and controlled	3.71	0.81	74.2	High
The schedule was always updated	3.54	1.06	70.8	
The required scheduling techniques were used	3.33	0.92	66.6	
The project team has been involved in creating the project schedule	3.33	1.20	66.6	
The required tools and techniques have been used in order to estimate the activities durations correctly	2.83	1.05	56.6	Medium
Project time management	*3.60*	*0.55*	*71.9*	*Medium*
All the response plans were created in coordination with the concerned parties	3.63	1.14	72.6	
All the defined risks have a response plans	3.42	1.1	68.4	
Risk management plan has been created	3.33	1.37	66.6	
All the risks were analyzed to define its probability and impacts	3.29	1.12	65.8	
Risks were identified frequently	3	1.29	60	
The necessary tools and techniques to evaluate the risks in the project were used	2.71	1.23	54.2	
The project has a risk register that were always updated	2.63	1.28	52.6	Medium
Project Risk	*3.14*	*0.99*	*62.9*	*Medium*

Table V.
Breakdown of the descriptive statistics (project management factors)

Questions' briefs	μ	σ	%	Degree
There were no major with-cost change requests	3.04	1.429	60.8	Medium
The project was finished on budget	2.83	1.494	56.6	Medium
Cost	*2.94*	*1.313*	*58.8*	*Medium*
The project met most of the scheduled milestones	3.42	1.176	68.4	Medium
The critical tasks and delivery dates were not slipping	3.17	1.274	63.4	Medium
The project was finished on time	2.71	1.334	54.2	Medium
Time	*3.10*	*1.042*	*61.9*	*Medium*
The ERP system meets its business objectives	4.12	0.85	82.4	High
The ERP system is well supported	4.08	0.83	81.6	High
The ERP system contributes in supporting decision making.	3.96	0.908	79.2	High
The ERP system meets the users' expectations	3.75	0.989	75	High
The project deliverables always fulfill the customer requirements	3.63	0.97	72.6	Medium
Specification	*3.91*	*0.804*	*78.2*	*High*

Table VI. Breakdown of the descriptive statistics (ERP project performance)

correctly before starting the project"; this may be because usually at the preparation phases of ERP projects, the project managers need input from the defined stakeholders to proceed in creating plans, schedules, defining requirements […], etc. While the lowest mean was for "The communication plan was always updated by the project management team", this could be because the ERP project manager became overloaded with many other tasks during the project, especially that he/she may be involved in the technical part of the project or overwhelmed with how to be back on track in some cases.

The overall mean for the project communication management factor was 3.79 with 75.8 per cent, indicating high levels of implementation of the project communication management activities in ERP projects.

(2) The means' range for the human resource management was from 3.0 to 4.04. The highest mean was for the item "There were clear roles and responsibilities for each member in the project"; as the case may be that the ERP project planners need to determine the required resources and their roles and responsibilities in the project, which is also an essential part of work in the project. While the lowest mean was for "A successful incentives system was implemented in the project". It is probably because the incentives system for the project is the same for the organization, and it is difficult to change it to be suitable for the project if it is not. The overall mean for the project human resource management factor was 3.48 with 69.7 per cent, indicating a moderate level for implementing the human resource management activities in the ERP projects.

(3) The range of the means for the project time management was from 2.83 to 4.25. The highest mean was for the item "All the activities in the project have been defined successfully in order to create the project schedule". This might be due to the fact that this item is required in creating the project schedule which is an essential part for the project. While the lowest mean was for "The required tools and techniques have been used in order to estimate the activities durations correctly such as; analogous estimating, 3 points estimates and expert judgments". This can be explained by the fact that the project managers depend on their teams in estimating the activities durations. The overall mean for project

time management factor was 3.60 with 71.9 per cent, indicating moderate level of implementing the time management activities in ERP projects.

(4) The means' range for the project risk management was from 2.63 to 3.63. The highest mean was for the item "All the response plans were created in coordination with the concerned parties"; this could be related to the difficulties that the project manager will face to create the response plan for the risks without involving the concerned parties, especially that some risks may need technical experts in the ERP fields. While the lowest mean was for "The project has a risk register that were always updated", this is due to the fact that the ERP project manager becomes overloaded with many other tasks during the project, especially that he/she may be involved in the technical part of the project or overwhelmed with how to be back on track in some cases. The overall mean for project risk management factor was 3.14 with 62.9 per cent. This is indicating moderate level of implementing the project risk management activities in the ERP projects.

Table VI shows the breakdown of the descriptive statistics related to the ERP project performance.

As shown in Table VI, there is moderate level of approval on all the questions related to the "cost" and "time"; on the other hand, there is a high level of approval on most of the questions related to the "based on specifications" indicator.

The highest mean for the cost indicator was for the item "There were no major with-cost change requests during the project" and for the time was for the item "The project met most of the scheduled milestones", finally for based on specifications item was "The ERP system meets its business objectives".

The lowest mean for the cost indicator was for "The project was finished on budget" and regarding the time, it was "The project was finished on time" and based on specifications indicator it was "The project deliverables always fulfill the customer requirements" specifications".

4.3 Correlation and multicollinearity

As shown in Table VII, Pearson correlation was used to test the relationships between independent variables:

It has been found that the highest r-value is 65.9 per cent between project time management and project communication management.

This value was used in variance inflation factor (VIF) equation to reach the result as follows:

$$\text{VIF} = 1/(1 - r^2)$$

$$\text{VIF} = 1/(1 - [0.659^2])$$

$\text{VIF} = 1.77 < 2.5$, which means that there is no multicollinearity according to Allison (1999).

4.4 Hypotheses testing

The researcher used multiple regressions to test the main hypothesis and the simple regression to test each single hypothesis.

In Table VIII, multiple regressions were used to test *H1* through *H1.4.3*.

Project management area		Project communication management	Project human resource management	Project time management	Project risk management
Project Communication Management	Pearson Correlation	1	0.615**	0.659**	0.602**
	Significance (two-tailed)	0.001	0.000	0.002	0.062
	n	24	24	24	24
Project Human Resource Management	Pearson Correlation	0.615**	1	0.605**	0.270
	Significance (two-tailed)	0.001		0.002	0.201
	n	24	24	24	24
Project Time Management	Pearson Correlation	0.659**	0.605**	1	0.649**
	Significance (two-tailed)	0.000	0.002		0.001
	n	24	24	24	24
Project Risk Management	Pearson Correlation	0.602**	0.270	0.649**	1
	Significance (two-tailed)	0.002	0.201	0.001	
	n	24	24	24	24

Note: **Correlation is significant at the 0.01 level (two-tailed)

Table VII.
Correlations' test result

Hypothesis No.	*F* calculated	*F* tabulated	*R*	R^2	Significance	Result
H1	5.49	2.01	0.447[a]	0.2	0.029*	Rejected
H1.1	1.94	1.96	0.389[a]	0.151	0.06	Failed to be Rejected
H1.1.1	1.95	1.96	0.387[a]	0.15	0.062	Failed to be Rejected
H1.1.2	0.95	1.96	0.199[a]	0.04	0.351	Failed to be Rejected
H1.1.3	2.452	1.96	0.463[a]	0.215	0.023[b]	Rejected
H1.2	2.655	1	0.493[a]	0.243	0.014	Rejected
H1.2.1	2.808	1.96	0.514[a]	0.264	0.01	Rejected
H1.2.2	1.616	1.96	0.326[a]	0.106	0.12	Failed to be Rejected
H1.2.3	2.381	1.96	0.453[a]	0.205	0.02	Rejected
H1.3	1.815	1.96	0.361[a]	0.13	0.083	Failed to be Rejected
H1.3.1	1.609	1.96	0.324[a]	0.105	0.122	Failed to be Rejected
H1.3.2	0.929	1.96	0.194[a]	0.038	0.363	Failed to be Rejected
H1.3.3	2.524	1	0.474[a]	0.225	0.019	Rejected
H1.4	1.258	1.96	0.259[a]	0.067	0.222	Failed to be Rejected
H1.4.1	1.195	1.96	0.247[a]	0.061	0.245[b]	Failed to be Rejected
H1.4.2	0.565	1.96	0.120[a]	0.014	0.578[b]	Failed to be Rejected
H1.4.3	1.711	1.96	0.343[a]	0.117	0.101	Failed to be Rejected

Notes: [a]the Dependant variable (ERP Performance); [b]the predictors (Communication, HR, Time, Risk); *the result of the main hypothesis H1

Table VIII.
The main hypothesis test

According to the decision rule of the *t*-test, *H1* is rejected, as the calculated value is greater than the tabulated value, accordingly, there is a positive relationship between project management knowledge and EPR project performance with correlation (R = 44.7 per cent) and R^2 (20.0 per cent), indicating that there is a statistically significant effect of project management knowledge area on ERP project performance.

H1.1,*H1.1.1*, *H1.1.2*, *H1.2.2*, *H1.3*, *H1.3.1*, *H1.3.2*, *H1.4*, *H1.4.1*, *H1.4.2* and *H1.4.3* failed to be rejected, as the calculated value is less than the tabulated value, indicating that:

- There is no statistically significant effect of communication management on ERP project performance and completing the project on budget and on time
- There is no statistically significant effect of human resource management on completing the project on time.
- There is no statistically significant effect of time management on EPR project performance, completing the project on budget and on time.
- There is no statistically significant effect of risk management on EPR project performance, completing the project on budget and on time.
- There is no statistically significant effect of risk management on completing the project based on the requested specification.

H1.1.3, *H1.2*, *H1.2.1*, *H1.2.3* and *H1.3.3* are rejected, as the calculated value is greater that the tabulated value, indicating that:

(1) There is a statistically significant effect of communication management on completing the project based on requested specification with correlation of $R = 46.3$ per cent and $R^2 = 21.5$ per cent.

(2) There is a statistically significant effect of HR management on:
   - EPR project performance, with correlation of $R = 49.3$ per cent and $R^2 = 24.3$ per cent.
   - Completing the project on budget, with correlation of $R = 51.4$ per cent and $R^2 = 26.4$ per cent.
   - Completing the project based on the requested specification, with correlation of $R = 45.3$ per cent and $R^2 = 20.5$ per cent.

(3) There is a statistically significant effect of time management on completing the project based on the requested specification, with correlation of $R = 47.4$ per cent and $R^2 = 22.5$ per cent.

H2. There is no significant effect on ERP project performance because of the implemented modules.

To test *H2*, one-way ANOVA test has been used.

Table IX shows the descriptive statistics of the effect on ERP project performance because of the implemented module:

Reference to Table IX, it is clear that there are virtual differences. Table X shows the statistical significant of those differences.

Table X shows that all F values are not significant at p-value less or equal to 0.05; therefore, there is no significant difference on ERP project performance because of the type or numbers of the implemented modules; this may be because of the fact that the project management activities that need to be implemented by the project managers are the same whatever the types or modules of the ERP system that will be implemented in the organization, accordingly the performance of the project will not necessarily be affected:

H3. There is no significant effect on ERP project performance because of the duration of the project.

The implemented modules	*n*	Mean	SD
Cost			
Product planning	5	3.7000	1.09545
Material purchasing	8	2.7500	1.36277
Finance	9	2.5556	1.23603
Inventory control	1	2.0000	
Human resource	1	5.0000	
Total	*24*	*2.9375*	*1.31308*
Time			
Product planning	5	3.2000	1.12052
Material purchasing	8	2.7500	0.68429
Finance	9	3.1852	1.21462
Inventory control	1	2.6667	
Human resource	1	5.0000	
Total	*24*	*3.0972*	*1.04248*
Specification			
Product planning	5	4.0800	0.17889
Material purchasing	8	3.8750	0.62278
Finance	9	3.7111	1.13627
Inventory control	1	4.0000	
Human resource	1	5.0000	
Total	*24*	*3.9083*	*0.80429*
ERP project performance			
Product planning	5	3.6600	0.71680
Material purchasing	8	3.1250	0.78874
Finance	9	3.1506	1.08624
Inventory control	1	2.8889	
Human resource	1	5.0000	
Total	*24*	*3.3144*	*0.93244*

Table IX. Descriptive statistics of the effect on ERP project performance due to the implemented module

To test *H3*, one-way ANOVA test has been used.

Table XI shows the descriptive statistics of the effect on ERP project performance because of the project duration.

In Table XI, it is clear that there are virtual differences; to find whether these differences are statistically significant, a one-way ANOVA has been conducted in Table XII.

Based on Table XII, there is no significant difference on ERP project performance because of the duration of the project, as all F values are not significant at p-values less or equal to 0.05; this could be because most of the projects have similar phases and activities whether they have long or short duration. Moreover, there are many other factors that may affect the project' duration; for example, the duration of a project may be shorter than that of other similar projects, but the team is more experienced in the shorter one, so it may be completed successfully while the other will not.

H4. There is no significant effect on ERP project performance because of the size of the project team.

The implemented modules	Sum of squares	df	Mean square	*F*	Significance
Cost					
Between groups	9.634	4	2.409	1.524	0.235
Within groups	30.022	19	1.580		
Total	*39.656*	*23*			
Time					
Between groups	4.893	4	1.223	1.156	0.361
Within groups	20.102	19	1.058		
Total	*24.995*	*23*			
Specification					
Between groups	1.706	4	0.427	0.615	0.657
Within groups	13.172	19	0.693		
Total	*14.878*	*23*			
ERP project performance					
Between groups	4.148	4	1.037	1.243	0.326
Within groups	15.849	19	0.834		
Total	*19.997*	*23*			

Table X.
One-way ANOVA to test *H2*

To test *H4*, one-way ANOVA test has been used.

Table XIII shows descriptive statistics of the effect on ERP project performance because of the size of the project team.

In Table XIII, it is clear that there are virtual differences; to find whether these differences are statistically significant, a one-way ANOVA was conducted in Table XIV.

All *F* values in Table XIV are not significant at *p*-values less or equal to 0.05; therefore, there is no significant difference on ERP project performance because of the size of the project team, and this is probably because the team may be small compared to other teams but knowledgeable and experienced.

H5. There is no significant effect on ERP project performance because of the type of the firm that the ERP is implemented on.

To test *H5*, the independent sample *t*-test has been used as shown in Table XV:

There is no significant difference on ERP project performance because of the type of the firm, as shown in Table XV; all *F* values are not significant at *p*-values less than or equal to 0.05; this can be due to the fact that the issues that may face the private sector or the public sector can be resolved through different corrective or preventive actions, such as giving incentives in the public sector to gain commitment or better performance.

H6. There is no significant effect on ERP project performance because of the size of the firm that the ERP is implemented on.

To test *H6*, a one-way ANOVA test has been used.

Table XVI shows the descriptive statistics of the effect on ERP project performance because of the size of the firm.

In Table XVI, there are virtual differences; to find whether these differences are statistically significant, a one-way ANOVA was conducted (Table XVII).

Project duration	*n*	Mean	SD
Cost			
less than 3	1	5.00	–
3 to less than 12	10	3.30	1.1595
12 to less than 24	4	3.13	1.43614
24 to less than 36	6	1.83	0.68313
36 and more	3	3.00	1.73205
Total	*24*	*2.94*	*1.31308*
Time			
less than 3	1	5.00	–
3 to less than 12	10	3.53	0.97119
12 to less than 24	4	2.92	1.2874
24 to less than 36	6	2.39	0.38968
36 and more	3	2.67	0.88192
Total	*24*	*3.10*	*1.04248*
Specification			
less than 3	1	5.00	–
3 to less than 12	10	4.08	0.49171
12 to less than 24	4	3.50	1.73205
24 to less than 36	6	3.83	0.36697
36 and more	3	3.67	0.57735
Total	*24*	*3.91*	*0.80429*
ERP Project Performance			
less than 3	1	5.00	–
3 to less than 12	10	3.64	0.75821
12 to less than 24	4	3.18	1.46241
24 to less than 36	6	2.69	0.24289
36 and more	3	3.11	0.90948
Total	*24*	*3.31*	*0.93244*

Table XI. Descriptive statistics of the effect on ERP project performance due to the project duration

Table XVII shows that all F values are not significant at p-values less than or equal to 0.05; consequently, there is no significant difference on ERP project performance because of the size of the firm. This could be justified that the issues that may face any firm implementing the ERP are similar, for example, the issues of redesigns the master files (chart of accounts, warehouse items, suppliers, etc.) and the problems with mapping old data to new structures.

5. Discussions and results

The purpose of this study is to investigate the project management factors that are affecting the ERP projects' performance in Jordan.

The research approach is divided into two phases:

(1) The first phase aims to define four of the project management factors that are affecting the ERP projects.

(2) The second phase aims to analyze and study the effect of the defined factors on the ERP projects in Jordan.

Project duration	Sum of squares	df	Mean square	*F*	Significance
Cost					
Between groups	13.035	4	3.259	2.326	0.094
Within groups	26.621	19	1.401		
Total	*39.656*	*23*			
Time					
Between groups	9.219	4	2.305	2.776	0.057
Within groups	15.776	19	0.83		
Total	*24.995*	*23*			
Specification					
Between groups	2.362	4	0.591	0.897	0.485
Within groups	12.516	19	0.659		
Total	*14.878*	*23*			
ERP project performance					
Between groups	6.458	4	1.615	2.266	0.1
Within groups	13.539	19	0.713		
Total	*19.997*	*23*			

Table XII. One-way ANOVA to test *H3*

Following this, a questionnaire was constructed and distributed to respondents representing 24 ERP projects in Jordan. Moreover, two interviews were conducted both with the project manager of the largest ERP project in Jordan and a consultant from the Big 5 consulting firms.

Prior to each interview, an interview script was created, and the interviews questions focused on the effect of the communication, human resource, time and risk management on ERP projects.

The interviews' results can be summarized as follows: communication management is the project management area that is affecting the ERP project performance the most. This is clear in the statement mentioned by the project manager:

> even if you have the best system in the world, without the communication management the project will definitely fail as the project manager should market the system within the team making sure that team members understand their contribution to the project success.

However, the project manager considers risk management as a major factor affecting the success of the project because it is related to all other areas: communication, human resource and even hardware of the system. So the risk should be taken into consideration at the beginning of the project for all the factors in the project and each risk should be analyzed, mitigated and monitored on a weekly basis throughout the project life cycle. On the other hand, the consultant confirms the importance of the communication management especially through involvement of various departments as some of them are ignored. Moreover, he considered the resistance to change as a huge risk on any ERP project.

Regarding the human resource area, the project manager confirms the importance of defining clear roles and responsibilities for the team members and training them on the nature of the upcoming work. The project manager also explains that incentives should be always connected to the performance of the team members. The consultant, however,

The size of the project team	*n*	Mean	SD
Cost			
Less than 5	5	3.30	1.483
5 to less than 100	10	2.85	1.415
10 to less than 15	3	2.67	1.155
15 and more	6	2.92	1.357
Total	*24*	*2.94*	*1.313*
Time			
Less than 5	5	3.53	1.502
5 to less than 100	10	3.27	1.004
10 to less than 15	3	2.78	0.839
15 and more	6	2.61	0.712
Total	*24*	*3.10*	*1.042*
Specification			
Less than 5	5	3.76	1.609
5 to less than 100	10	4.02	0.426
10 to less than 15	3	4.00	0.000
15 and more	6	3.80	0.716
Total	*24*	*3.91*	*0.804*
ERP project performance			
Less than 5	5	3.53	1.499
5 to less than 100	10	3.38	0.834
10 to less than 15	3	3.15	0.651
15 and more	6	3.11	0.813
Total	*24*	*3.31*	*0.932*

Table XIII. Descriptive statistics of the effect on ERP project performance due to the size of the project team

mentioned that the wrong selection of client team through assigning weak and inefficient team to work with the consultant is one of the main reasons for the ERP projects failure.

The time management is also an important form of the project manager's point of view, as the project plan needs to be realistic and should always be updated from the resources' side: the implementation time and the deliverables. The consultant in this area confirms the importance of the top management support and the team commitment to actively participate in the project as the whole project can be halted, delayed or may fail if there were no enforcement from the top management on their employees and commitment from the employees working on the project.

The results of the interviews confirm the effect of the four project management areas on the ERP project performance, although the questionnaire results do not support the effect of risk management on the ERP project performance. On the other hand, the effect of risk management is consistent with Ziemba and Oblak (2013), Davide *et al.* (2012), Amid *et al.* (2012).

The effect of human resource management on the ERP project performance is consistent with Altuwaijri and Khorsheed (2012), Amid *et al.* (2012), Ziemba and Oblak (2013).

Regarding the effect of communication management on completing the project based on the requested specification is consistent with what has been explained by Gyampah and Salam (2004) that the communication creates the path through which employees

The size of the project team	Sum of squares	df	Mean square	*F*	Significance
Cost					
Between groups	0.956	3	0.319	0.165	0.919
Within groups	38.7	20	1.935		
Total	*39.656*	*23*			
Time					
Between groups	2.962	3	0.987	0.896	0.46
Within groups	22.033	20	1.102		
Total	*24.995*	*23*			
Specification					
Between groups	0.33	3	0.11	0.151	0.928
Within groups	14.548	20	0.727		
Total	*14.878*	*23*			
ERP project performance					
Between groups	0.612	3	0.204	0.21	0.888
Within groups	19.385	20	0.969		
Total	*19.997*	*23*			

Table XIV.
One-way ANOVA to test *H4*

Project performance dimensions	*t*	df	Significance (two-tailed)	Type of firm	*n*	Mean	SD
Cost	0.526	22	0.604	Private	17	3.03	1.281
				Public	7	2.71	1.468
Time	0.863	22	0.398	Private	17	3.22	1.148
				Public	7	2.81	0.716
Specification	0.086	22	0.932	Private	17	3.92	0.878
				Public	7	3.89	0.652
ERP project performance	0.591	22	0.561	Private	17	3.39	0.988
				Public	7	3.14	0.822

Table XV.
Independent sample *t*-test to test *H5*

from several functional and technical areas share the required information that can lead to a successful implementation of ERP systems.

Finally, the effect of time management on completing the project based on the requested specification is consistent with Stephan *et al.* (2010) as he confirms the importance of taking the scope of the project into consideration when setting the timeframe.

6. Recommendations

Project management is a key factor for successful ERP implementation and often inadequate project management skills play a major role in failed implementations. Accordingly, it is very important to have a qualified project manager for any ERP project, and effective communication is very important to develop trust between employees and helps to exchange the information needed for the successful ERP implementation. The effective communication can be applied through many ways such

Size of the firm	*n*	Mean	SD
Cost			
Less than 30	1	4.00	–
50 to less than 100	2	3.50	0.707
100 to less than 250	5	2.20	1.037
250 and more	16	3.03	1.420
Total	*24*	*2.94*	*1.313*
Time			
Less than 30	1	4.00	–
50 to less than 100	2	3.83	0.236
100 to less than 250	5	2.40	0.279
250 and more	16	3.17	1.161
Total	*24*	*3.10*	*1.042*
Specification			
Less than 30	1	4.00	–
50 to less than 100	2	4.40	0.566
100 to less than 250	5	3.80	0.400
250 and more	16	3.88	0.943
Total	*24*	*3.91*	*0.804*
ERP project performance			
Less than 30	1	4.00	–
50 to less than 100	2	3.91	0.031
100 to less than 250	5	2.80	0.372
250 and more	16	3.36	1.062
Total	*24*	*3.31*	*0.932*

Table XVI. Descriptive statistics of the effect on ERP project performance due to the size of the firm

Size of the firm	Sum of squares	df	Mean square	*F*	Significance
Cost					
Between groups	4.622	3	1.541	0.879	0.468
Within groups	35.034	20	1.752		
Total	*39.656*	*23*			
Time					
Between groups	4.406	3	1.469	1.427	0.264
Within groups	20.589	20	1.029		
Total	*24.995*	*23*			
Specification					
Between groups	0.568	3	0.189	0.265	0.85
Within groups	14.31	20	0.716		
Total	*14.878*	*23*			
ERP project performance					
Between groups	2.535	3	0.845	0.968	0.427
Within groups	17.462	20	0.873		
Total	*19.997*	*23*			

Table XVII. One-way ANOVA to test *H5*

as: creating communication plan, regular meetings with the team and distributing the minutes of meetings for the concerned people.

Moreover, the well-prepared and qualified team will definitely help their manager to complete the project successfully; this can be achieved through defining clear roles and responsibilities to understand their assignments and give them the required training to increase their capabilities and their knowledge level. On the other hand, the motivations and incentives that are connected to the performance and results will also help the team to commit to their tasks and achieve the required results.

Finally, the complexity of the ERP project requires taking the scope accurately into consideration when creating the project plans and schedules; furthermore, the schedule should also be realistic to achieve the desired results.

7. Research limitations

This type of research is targeting the ERP projects in Jordan which is part of the services provided by some of the IT companies. Consequently, defining each ERP project specifically was difficult, especially because of the lack of previous studies about ERP projects. Moreover, most of the literature consisted of case studies targeting two or three ERP projects only, so there are no logs or documents to provide this information.

References

Allison, P.D. (1999), *Multiple Regressions: A Primer*, Pine Forge Press, Thousand Oaks, CA.

Altuwaijri, M.M. and Khorsheed, M.S. (2012), "InnoDiff: a project-based model for successful IT innovation diffusion", *International Journal of Project Management*, Vol. 30 No. 1, pp. 37-47.

Amid, A. Moalagh, M. and Ravasan, A.Z. (2012), "Identification and classification of ERP critical failure factors in Iranian industries", *Information system*, Vol. 37 No. 3, pp. 227-237.

Andersson, A. (2016), "Communication barriers in an Interorganizational ERP-project", *International Journal of Managing Projects in Business*, Vol. 9 No. 1, pp. 214-233.

Ara, A. and Al-Mudimigh, A. (2011), "The role and impact of project management in ERP project implementation life cycle", *Global Journal of Computer Science and Technology*, Vol. 11 No. 5, pp. 7-10.

Bearing Point (2004), "Implementing ERP systems in the public sector: nine sure ways to fail or succeed", White Paper Enterprise Solutions, available at: www.purdue.edu/onepurdue/about/documents/implementing_erp_public_000.pdf, (accessed 14 May 2014).

Beatty, R.C. and Williams, C.D. (2006), "ERP II: best practices for successfully implementing an ERP upgrade", *Communications of the ACM*, Vol. 49 No. 3, pp. 105-109.

Bernard, W. and David, T. (2003), "Critical Success Factors for ERP Projects", *Australian Institute of Project Management Conference Program 2003, Sydney, Australia, 12-14 October 2003*, pp. 1-8.

Bhatti, T.R. (2005), "Critical success factors for the implementation of enterprise resource planning (ERP): empirical validation", *The Second International Conference on Innovation in Information Technology (IIT'05), Dubai, 26-28 September 2005*, pp. 1-10.

Carol, A.M. and John, F.S. (1999), *The Digital Work Force: Building Infotech Skills at the Speed of Innovation*, 1st ed., Department of Commerce Technology Administration Office of Technology Policy, US-Goverment, NY.

Charlie, C.C. Chuck, C.L. and Samuel, C.Y. (2009), "Managing ERP implementation failure: a project management perspective", *IEEE Transactions on Engineering Management*, Vol. 56 No. 1, pp. 157-170.

Christofi, M., Nunes, M., Peng, G. and Lin, A. (2013), Towards ERP success in SMEs through business process review prior to implementation", *Journal of Systems and Information Technology*, Vol. 15 No. 4, pp. 304-323.

Davide, A., Riccardo, D. and Valeria, M. (2007), "Risk management in ERP project introduction: review of a literature", *Information and Management*, Vol. 44 No. 6, pp. 547-567.

Davide, A., Riccardo, D. and Valeria, M. (2012), "Modelling and assessing ERP project risks: a Petri Net approach", *European Journal of Operational Research*, Vol. 220 No. 2, pp. 484-495.

Dezdar, S. and Ainin, S. (2011), "Examining ERP implementation success from a project environment perspective", *Business Process Management Journal*, Vol. 17 No. 6, pp. 919-939.

Duggal, J. (2010), "Next level up: how do you measure project success? Rethinking the triple constraint", PMI Community Post, available at: www.pmi.org/Knowledge-Center/Next-Level-Up-How-Do-You-Measure-Project-Success.aspx (accessed 29 October 2013).

Erik, L. and Clifford, G. (2011), *Project Management the Managerial Process*, 5th ed, McGraw-Hill, New York, NY.

Evangelia, M., Damianios, S. and Theodore, C. (2012), "Communication management in business: the latent power for career development", *Proceedings of the 2nd International Conference on Integrated Information, Budapest, Hungary, 30 August-3 September 2012*, pp. 319-326.

Gyampah, K. and Salam, A.F. (2004), "An extension of the technology acceptance model in an ERP implementation environment", *Information and Management*, Vol. 41 No. 6, pp. 731-745.

Hawari, A. and Heeks, R. (2010), "Explaining ERP failure in a developing country: a Jordanian case study", *Journal of Enterprise Information Management*, Vol. 23 No. 2, pp. 135-160.

Henri, B. Suzanne, R. and Jean, T. (1993), "Toward an assessment of software development risk", *Journal of Management Information Systems – Special Section: Strategic and Competitive Information Systems*, Vol. 10 No. 2, pp. 203-225.

Holland, C.P. and Light, B. (1999), "A critical success factors model for ERP implementation", *IEEE Software*, Vol. 16 No. 3, pp. 30-35.

Kamhawi, E.M. (2008), "Enterprise resource planning systems adoption in Bahrain: motives, benefits, and barriers", *Journal of Enterprise Information Management*, Vol. 21 No. 3, pp. 310-334.

Kinz (2014), available at: www.kinz.jo/ (accessed 8 January 2014).

Kraemmer, P. Moller, C. and Boer, H. (2003), "ERP implementation: an integrated process of radical change and continuous learning", *Production Planning & Control*, Vol. 14 No. 4, pp. 338-348.

Mohammad, I.M. (2010), "Factors leading to successful ERP implementation: an integrated framework", *Southwest Decision Sciences Institute Conference, Texas, 3-6 March 2010*.

Moohebat, M.R., Jazi, M.D. and Asemi, A. (2011), "Evaluation of the ERP implementation at Esfahan steel company based on five critical success factors: a case study", *International Journal of Business and Management*, Vol. 6 No. 5, pp. 236-250.

Nah, F. Zuckweller, K. and Lau, J. (2003), "ERP implementation: Chief Information Officers' perceptions of critical success factors", *International Journal of Human-Computer Interaction*, Vol. 16 No. 1, pp. 5-22.

Nah, F.F. and Delgado, S. (2006), "Critical success factors for enterprise resource planning implementation and upgrade", *Journal of Computer Information Systems*, Vol. 46 No. 5, pp. 99-113.

Paivi, I. (2009), "The ERP project risk assessment: a case study", *Proceedings of the World Congress on Engineering, London, 1-3 July 2009*.

Poba-Nzaou, P., Raymond, L. and Fabi, B. (2008), "Adoption and risk of ERP systems in manufacturing SMEs: a positivist case study", *Business Process Management Journal*, Vol. 14 No. 4, pp. 530-550.

Project Management Institute (2008), *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*, 4th ed, Project Management Institute, Philadelphia, PA.

Protiviti Risk and Business Consulting (2011), "Managing risks as part of ERP implementations", White Paper, available at: www.protiviti.com/en-US/Documents/POV/POV-ERP-Implementations-Protiviti.pdf (accessed 22 February 2015).

Ram, J., Corkindale, D. and Wu, M. (2013), "Examining the role of system quality in ERP projects", *Industrial Management & Data Systems*, Vol. 113 No. 3, pp. 350-366.

Stephan, A.K., Herwig, O. and Roland, S. (2010), "A comparison of ERP-success measurements approach", *Journal of Information Systems and Technology Management*, Vol. 7 No. 2, pp. 281-310.

Tingting, H. and Kazuhiko, Y. (2016), "Comprehensive review of literature survey articles on ERP", *Business Process Management Journal*, Vol. 22 No. 1, pp. 2-32.

Wiklund, J., Per, D. and Delmar, F. (2003), "What do they think and feel about growth? An expectancy-value approach to small business managers' attitudes toward growth", *Entrepreneurship Theory and Practice*, Vol. 27 No. 3, pp. 247-270.

William, D. (2008), *Project Management Communications Bible*, 1st ed., Wiley Publishing, Indianapolis, IN.

Ziemba, E. and Oblak, I. (2013), "Critical success factors for ERP systems implementation in public administration", *Interdisciplinary Journal of Information, Knowledge, and Management*, Vol. 8 No. 1, pp. 1-19.

Zikmund, W. (2003), *Business Research Methods*, 7th ed., South Western, Mason.

Further reading

Omotayo, F. and Babalola, S. (2016), "Factors influencing knowledge sharing among information and communication technology artisans in Nigeria", *Journal of Systems and Information Technology*, Vol. 18 No. 20.

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