

# An Investigation on the Critical Factors of Information System Implementation in Jordanian Information Technology Companies

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## Abstract

Current modern life styles, huge amount of the data available and the increased complexity of software products made IT projects extremely challenging projects. In Jordan, IT projects play a significant role in the country's economy. Unfortunately, high percentages of IT projects are considered to be failed or challenging projects. To avoid project failure, success factors must be maintained and enhanced. This study aims to provide a clear definition of critical success factors in IT projects in Jordan, and to explore the differences in the attitudes of project managers and CEO towards such factors. A structured questionnaire was distributed to a random sample of 118 CEOs and project managers. A total number of 90 completely filled questionnaires were returned. A quantitative data analysis has been conducted for the 18 success factors using SPSS software and Excel program. The study revealed that the majority of IT companies in Jordan have a success rate of 75%. Moreover the study implied that project managers are considered to be the most responsible part for project success. In these organizations, the usage of web applications and Email dominated the list of information transfer methods. According to t-test paired result, there is a clear agreement between the two groups (CEOs and Project Managers) on the critical success factors' importance in IT projects in the Jordanian organization. The study recommends highly giving attention to technical concerns in projects and product quality, highly focusing on project management concepts and effective regulations. Furthermore, effective communication between all project stakeholders and minimal customization of the systems introduced are highly recommended by the study.

**Keywords:** Information System, Information Technology, CEOs, Project Managers

## 1. Introduction

Rapid changes, technological advancement, globalization and competition, are considered to be the main characteristics of the current life. For this purpose, information technology (IT) projects compete to help other organizations adapt with these critical concerns by providing them with the most effective information systems (IS), especially when most organizations move toward automation and computerized operations, and depend more on information systems (Gingnel et al., 2014).

IT companies depend on information systems (IS) through their activities by combining computer hardware, software, electronics, semiconductors, internet, equipment, e-commerce, and computer services to produce the needed products, services, solutions, consultants and training programs (Almajali, et al., 2015). But information systems do not depend only on information technology as many may think; they also use manual procedures, models, knowledge bases and databases to store, process and deliver information (Yeo, 2002; Masa'deh et al., 2014).

The information systems provide several benefits to both process and organization. They improve communication and staff participation, and increase process efficiency by decreasing the time needed to solve problems, and increasing products and services' quantity. Moreover, ISs improve the financial outcomes by increasing sales, decreasing costs and personnel and concentrating on the customers and markets to provide them with better services, and as a result improving the profits (Alavi and Leidner, 1999).

Using information systems, organizations can achieve a competitive advantage in managing information

which enables them to adapt, compete and ensure the availability of necessary information to all organizations' stakeholders such as managers, suppliers, employees, and customer (Bowman, 2002). Moreover, ISs have a significant role in coordinating all organizations' functions by exchanging and analyzing information, and supporting the firms' strategy and operations and developing their performance effectively (Yeo, 2002).

Several factors affect projects' success. These factors are the basic issues inherent in the project, which must be maintained in order for the team to work efficiently and effectively. So they require day-to-day attention throughout the life of the project, which are called critical success factors (CSFs) (Rowlinson, 1999).

But information systems don't always succeed. An IS is considered successful when its goals are completed within the budget, schedule, and when it meets the customer requirements (Yeo, 2002). Otherwise, the system will fail. Hence, if the project manager doesn't understand users' needs, or if the project scope is not well defined, or if the project deadlines are unrealistic, or if there are no skilled people involved in the project, it will suffer from failure symptoms (Reel, 1999).

Major parties included in those projects, such as senior management, project managers, team members, systems, users, suppliers and customers (Sudhakar, 2012). Thus, it is a challenge to measure the project success, because the different parties that are involved in the project, have different perspectives to project success evaluation. Project managers, for example, may measure project success, according to its objective achievements; on the other hand, top management may consider it as unsuccessful project.

Jordan also faces the same challenges, so, IT projects play a significant role in the Jordanian economy. According to the Information and Communication Technology Association – Jordan (Intaj) there are about 203 companies - with different structure, different employee numbers and different experiences, producing a full range of products, services, solutions and training locally and globally to all economic sectors.

As appeared from the initial conducted survey, in Jordan there are about 35 projects that faced bankruptcy recently and 8 others underwent mergers. Many projects fail after only a short period of time as they concentrate only on short term profit, or because they lack the qualified human resources or because of late payment by end users, and sometimes due to government policies that minimize costs by reducing offers presented from ministries or governmental institutions to develop their ISs, and train their employees, which affect them negatively. So they have a shift toward bankruptcy or merger with other companies.

## 2. Literature Review

Many researchers have studied critical success factors in different organizations, different countries and based on different perspectives, because it is important to identify the factors that affect the project success positively. The following section provides a brief discussion of important studies in this area:

Nasir and Sahibuddin (2011) studied 26 critical success factors related to software projects and ranked them according to their frequency in the literature. Then they classified them into three groups: people-related factors (7), process-related factors (16) and technical-related factors (3). They demonstrated that the most critical success factors of software projects are: clear and frozen requirement, clear objectives and goals, realistic estimation of schedule and budget, competent project manager and top management support.

Another study conducted by Imtiaz *et al.*, (2013), they reviewed (15) critical success factors relevant to IT projects by depending on the previous related research, they also referred to the frequency of those factors in the literature. They found that the most factors are: top management support, clear goals, team capability, customer involvement and effective communication. The others are: leadership, adequate requirement, teamwork, effective monitoring and control, budget support, training, risk management, select the right team, process quality and progress schedule.

In a conceptual model for (Sudhakar, 2012), he studied 80 factors related to software projects, and then he classified them into seven categories: These categories are: communication factors, technical factors, organizational factors, environmental factors, product factors, team factors and project management factors. After that he identified top five factors in each group according to their occurrences in the literature review. According to this study the most critical success factors are: top management support, communication project, project planning, project control, project schedule, project manager competencies, clear project goal, user involvement, leadership, technical tasks, customer involvement, team capability, team work, select the right team, realistic expectation and trouble shooting.

Gingnell *et al.*, (2014) applied Bayesian model – which is an interpretation of probability concept - in their study in 2014 in a trial to improve IT project performance by calculating the probability of project failure regarding (time, budget and quality), and to estimate the best practices for project management decisions depending on any of the twenty one success factors. They depended on the Bayesian model to investigate the effect of twenty one success factors on the project success criteria (according to quality, time and budget) independently. They found that top management support is the most important factor regarding time, but for the budget, the project manager is considered to be the most important factor, and for project quality user involvement is the most critical factor. Based on that, management must manage those factors according to the success criteria, it depends on,

which is not an easy task.

Tuzcu and Esatoglu illustrated that not all the success factors affect the project success in a study implemented on 68 project managers in information technology projects in the capital of Turkey, Ankara in 2011; They found that some factors have no impact on project success like: project manager experience, project manager change during the project, staff reward, well-defined project scope, the existence of project calendar and requirements, the support of sponsors, good personal estimation, customer participation and risk management. They mentioned that the only factors influencing project success are: the clear and precise determination of requirements at the start of the project and the availability of enough time needed for that.

Although many researchers identified large numbers of success factors to avoid project failure, some projects still suffer from failure (Ram *et al.*, 2013). They said that it is important to concentrate on critical factors only, which are the factors that have proven influence on project performance or project success, and not on all factors. This study was different because it aimed at testing thirty three success factors for their association with project success and fifteen factors for their relationship with project performance by looking for some evidences in the literature that approved relationship between success factors and project performance, profitability, customer benefit, efficiency and control.

The first study to measure the validity and utility of CSFs concept was done by Ram and Corkindale (2014); they reviewed a large number of critical success factors related to ERP projects implementation and performance, which are included in papers published between 1998 and 2010, and classified them according to publications which identify CSFs, other which concentrate in the CSFs management, and the rest that study CSFs effect on success implementation or performance. They also classified the identified factors into four groups that are: organization –related, technological-related, project –related and individual related. They found that only a limited number of CSFs have influenced project success or performance.

This research concentrates on the following success factors only on the Jordanian IT project success in Jordanian organizations, since they are considered critical factors, by most researchers and they have proved evidence to be critical, according to Ram and Corkindale (2014). They also are have been heavily studied in the literature:

- Building the right team and team work: The staff must consist of suitable people of a cross functional team with the needed technical skills (Biehl, 2007) (Reel, 1999).
- Team Capability: the team must have the expected qualifications, knowledge, experience and the technical abilities needed to design and implement IS and to continually improve it (Fortune and White, 2006).
- Clear goals: project goals determined by end users must be defined well to prevent any failure in the system (Fortune and White, 2006).
- When designing the system, staff needs top management support to implement it by allocating the suitable resources (people and time) and through legitimizing the new system and linking it with organizational structure to facilitate its use (Biehl, 2007).
- Financial support: as infrastructure, equipment, training and development expenses are needed in IS design and implementation process (Sudhakar, 2012).
- Training: It's important to train the staff who design and implement IS (Fortune and White, 2006). In addition, training is necessary for the system users to provide them with the ability and confidence which enable them to gain the systems advantages (McLeod and MacDonell, 2011).
- Process quality: quality standards should be established to monitor process quality from the beginning of the project (Imtiaz et al, 2013).
- Effective communication between users and system designers considered to be a critical factor. Applicable and effective systems need appropriate input from the users (Rosario, 2000). On the other side, it is needed to promote the changes caused by new systems.
- It is important to implement the basics of project management when designing and implementing a system, as a system is considered to be a project. So the scope should be identified by clearly determining the system objectives, benefits, budgets and schedule followed by defining milestones to assess the system design and implement process. Moreover, effective control at all stages is important for the quality of the project (Reel, 1999; Ding and Wang, 2008; Fan, 2010; Sudhakar, 2012).
- Leadership: project managers' charisma affects IS implementation success; they must use it to influence the team to achieve project objectives. They must also have strong technical and relational skills (Biehl, 2007).
- Host organizational structure, policies and culture affect the success of the system. When those components emphasize the changes toward business strategy, it will facilitate system design and implementation within the organization. In addition to the policy of re-training and re-Skilling to improve performance and to adapt to changes caused by new systems.
- When implementing the system, it is necessary to depend on minimal customization to avoid any errors or bad use, and to exploit its advantages and benefits (Bingi et al., 1999).

- Before actual implementation of the system, its staff must test the system and make the troubleshooting in coordinating with the users, specialists and consultants to achieve a successful system (Nah and Lau, 2001).
- Risk management: risk analysis must be done at the beginning of the project to be able to manage it by avoiding, reducing it (Fan, 2010).
- Customer involvement: direct interaction with the end users is necessary in the development process (Fortune and White, 2006).

A brief list of some of the identified CSFs grouped by their context is given in Table 1, which is similar to the lists found in (Nasir and Sahibuddin, 2011; Sudhakar, 2012; Imtiaz et al, 2013).

This study differs from other similar previous studies as this study is considered to be the only study – according to researchers' knowledge – that is implemented in the information technology projects in Jordan.

Organizations in Jordan differ in political, sociocultural, economic and environmental factors that affect the IT projects.

The study tends to compare the attitudes of the CEOs and project managers of the IT companies, this introduce a comprehensive evaluation of success factors and their importance. .

The researchers based on several tools to implement this study. This research reviewed the previous researches to collect the most important factor, and then investigated the existence of those factors in IT projects through a survey and finally, interview project CEOs and project managers to evaluate the importance of these factors and their effect on project success.

It is considered to be an extension of the previous studies, an implementation of their recommendation and an avoidance of their limitations.

Table 1. Critical Success Factors That Will Be Studied

Critical success factor	References
Building the right team and team work	(Ram and Corkindale, 2014), (Sudhakar,2012), (Imtiaz <i>et al.</i> ,2013), (Nah and Lau, 2001), (Belassi and Tukul,1996), (Reel,1999), (Nasir and Sahibuddin, 2011)
Team capability	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> , 2013), (Sudhakar, 2012), (Belassi and Tukul, 1996), (Nasir and Sahibuddin, 2011), (Fortune and White, 2006).
Clear goals	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> , 2013), (Sudhakar, 2012), (Nasir and Sahibuddin, 2011), (Fortune and White, 2006).
Top management support	(Ram and Corkindale , 2014 ), (Imtiaz <i>et al.</i> ,2013), (Sudhakar,2012), (Nah and Lau, 2001), (Belassi and Tukul, 1996), (Nasir and Sahibuddin,2011), (Biehl, 2007).
Financial support	(Imtiaz <i>et al.</i> , 2013), (Sudhakar, 2012), (Belassi and Tukul,1996), (Cleland and King,1983),(Kamal,2006)
Training	(Ram and Corkindale, 2014 ), (Imtiaz <i>et al.</i> ,2013), (Nasir and Sahibuddin,2011), (McLeod and MacDonell, 2011) (Wong and Tein, 2004)
Process quality	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> , 2013), (Reel, 1999).
Effective communication	(Imtiaz <i>et al.</i> ,2013), (Sudhakar,2012), (Nah and Lau, 2001),( Belassi and Tukul,1996), (Nasir and Sahibuddin,2011), (Rosario, 2000)
Clear requirements	(Imtiaz <i>et al.</i> ,2013), (Belassi and Tukul,1996), (Nasir and Sahibuddin, 2011), (Tuzcu and Esatoglu,2011)
Realistic budget	(Nasir and Sahibuddin, 2011), (Ding and Wang, 2008), (Fan, 2010).
Progress report	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> ,2013), (Reel, 1999), (Nasir and Sahibuddin, 2011)
Effective control	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> , 2013), (Sudhakar, 2012), (Nah and Lau, 2001) , (Belassi and Tukul,1996), (Nasir and Sahibuddin,2011)
Proper planning	(Ram and Corkindale, 2014), (Sudhakar,2012), (Belassi and Tukul,1996), (Nasir and Sahibuddin, 2011)
Leadership	(Ram and Corkindale,2014), (Imtiaz <i>et al.</i> , 2013), (Sudhakar,2012), ( Belassi and Tukul,1996), (Nasir and Sahibuddin,2011), (Biehl, 2007)
Host organizational structure, policies and culture	(Ram and Corkindale, 2014 ), (Sudhakar,2012), (Belassi and Tukul, 1996)
Minimum customization	(Nah and Lau, 2001), (Bingi <i>et al.</i> ,1999)
Troubleshooting	(Sudhakar, 2012), (Nah and Lau, 2001), (Belassi and Tukul,1996)
Risk management	(Imtiaz <i>et al.</i> , 2013), (Nasir and Sahibuddin,2011), (Fan,2010 )
Customer involvement	(Ram and Corkindale, 2014), (Imtiaz <i>et al.</i> , 2013), (Belassi and Tukul, 1996), (Nasir and Sahibuddin, 2011), (Sudhakar, 2012), (Fortune and White, 2006).

### 3. Research Methodology and Hypotheses Development

In order to carry out the study objectives, a structured questionnaire was distributed to a selected number of information technology companies in Jordan. Data were collected according to the following methodology:

### 3.1 Methodology

A thorough review of the results of recent published papers which reveal the different factors affecting IS implementation success in IT organizations. According to the previous step, a questionnaire was designed to identify critical success factors for the selected companies, taking in mind the following questions:

- A. To what extent the critical success factors exist within the organizations?
- B. To what extent do these factors cause success to the IS implementation in IT organizations in Jordan?

Then, the survey was implemented by distributing the questionnaire manually and electronically on the selected sample from the population to gain the needed data.

Statistical analysis of the gathered data was performed, using several statistical methods like frequency index, severity index, importance index, and t-test paired. The frequency index is used to order success factors, according to occurrence frequency. While, the severity index orders success factors, according to factors' severity on the project success. The importance index is used to determine the importance evidence for each factor which can be calculated by multiplying the frequency index and the severity index. Finally, discussing the results and developing the recommendations.

### 3.2 Population and Sample

The research scope encompasses the information technology industry in Jordan, and the respondents included CEOs and project managers. To achieve valid results a thorough process of selecting a representative random sample was conducted, as surveying the entire industry was infeasible. A sample of 59 companies of the IT companies in Jordan was selected with help from Information and Communication Technology Association – Jordan (Intaj) website. 37 CEOs and 53 project managers in those companies responded, and the study is conducted based on the information collected from them (Table 2 shows the number of sent questionnaire and respondents). The participants were asked to fill the designed questionnaire.

According to the Information and Communication Technology Association – Jordan (Intaj), there are around 203 IT and communication companies in Jordan, divided into the following categories: outsourcing company, Digital content, ISP, Non ICT and IT companies.

Table 2. Questionnaire and Responses Average Information

Type / Kind	CEO	Project Manager	Total	Percent (%)
Num. of Sent questionnaires	53	65	118	100%
Num. of Returned Responses / questionnaires	51	63	114	97%
Num. of Excluded Responses / questionnaires	14	10	24	20%
Num. of Selected Responses (Valid for Analysis)	37	53	90	76%
Responses Average	96%	97%	97%	

During the study, 118 questionnaires were distributed to the participants either by email or by handing them to the participants. 114 of the participants responded to the questionnaire, and this is considered as an acceptable percentage. Among the returned responses, 24 responses were excluded as the participants didn't respond to all the questionnaire questions, and that makes it not valid for the statistical analysis. Based on that, the percent of usable responses is 76%.

### 3.3 Data Collection

Data were collected by two methods:

- **Secondary Data:** a comprehensive review of recent papers, books, references and electronic sites to provide us with a strong theoretical basis related to the study.
- **Primary Data:** by implementing the questionnaire on the selected sample and interviewing CEOs and project managers within the sample to provide us with the extent of success factors existence within their organizations and their opinions about the factors importance. Then analyzing data and making conclusions. The questionnaire was evaluated by a group of experts in the study field. There was only one form of the questionnaires that target both of the CEO and project managers.

#### *Q1. What is the frequency of occurrence for each factor?*

A likert scale was used with rating ranging from 1 (never) to 5 (always): always, often, sometimes, rarely, never. Table 3 shows the weight for the mentioned dimensions.

Table 3. Frequency of Occurrence Matrices

Choice	Weight
Always	5
Often	4
Sometimes	3
Rarely	2
Never	1

**Q2. What is the degree of severity for each factor?**

A likert scale was used with rates ranging from 1 (not at all influential) to 5 (extremely influential): extremely influential, very influential, somewhat influential, slightly influential, and not at all influential. Table 4 shows the weight for the above mentioned dimensions.

Table 4. Degree of Severity Matrices

Choice	Weight
Extremely influential	5
Very influential	4
Somewhat influential	3
Slightly influential	2
Not at all influential	1

Critical success factors were classified according to the following groups, which are inspired by the work of (Sudhakar, 2012) groups- :

- Team factors: factors related to the project team members.
- Project management factors: factors related to the project management principles.
- Organizational factors: factors related to the company's financial and managerial ability to achieve the projects.
- Environmental factors: factors related to the host organizational structure and the direct interaction with the clients.

**3.4 Study Hypotheses**

**Null hypothesis:** There are no statistically significant differences in attitudes of CEOs and project managers toward critical success factors' importance in IT projects in Jordan at the level of significance  $\alpha=0.05$ .

**Alternative hypothesis:** There are statistically significant differences in attitudes of CEOs and project managers toward critical success factors' importance in IT projects in Jordan at the level of significance  $\alpha=0.05$ .

**3.5 Statistical Data Analysis**

Statistical Package for Social Sciences (SPSS) and EXCEL have been used to conduct quantitative data analysis.

**The following statistical measures have been used:**

1- *Average, frequency and percentile* to describe the sample.

2- *The frequency index* is used to order success factors, according to frequency occurrence, using the following equation (Assaf and AL-Hejji,2006):

$$F (\%) = \sum a (n/N) * 100/5.....$$

Equation 1 Frequency Index

Whereas:

F: Frequency Index

a: the weight for each choice , as in table number 3.

n: answers frequencies

N :total number of respondents

3- *The severity index* orders success factors, according to factors' severity on the project success, by using the following equation(Assaf and AL-Hejji,2006):

$$S (\%) = \sum A (N/N) * 100/5.....$$

Equation 2: Severity Index.

Whereas:

S :Severity Index

a: the weight for each choice , as in table number 4.

n: answers frequencies

N: total number of respondents

4- *The importance index* is used to determine the importance evidence for each factor, which can be calculated by multiplying the frequency index and the severity index, using the following equation(Assaf and AL-

Hejji,2006):

$$\text{IMP.I (\%)} = [ F (\%) * S (\%)] / 100 \dots\dots\dots$$

Equation 3: Importance Index

Whereas:

IMP.I: Importance Index

S: Severity Index

F :Frequency Index

5- **Spearman Correlation Coefficient** is used to investigate the strength of relationship between factors' groups, and the degree of agreement on factors' order between CEOs and project managers (Assaf and AL-Hejji, 2006).

6- **T-test paired** was used to test the study hypotheses.

7- **Cronbach's Alpha Coefficient** to estimate the reliability of questionnaire's paragraphs.

### 3.6 Goodness of Measures

It's important to make sure that the developed questionnaire measures the real study variables accurately, which is called goodness of measure. It involves both validity and reliability of the questionnaire.

#### 3.6.1 Validity (expert)

It refers to the ability of the questionnaire to measure the right concept (accuracy). This can be achieved by reviewing the related literature and conducting the initial study in some IT projects to design the initial questionnaire, then the initial draft of questionnaire was validated to concord with the Jordanian environment through a group of experts in project management and information technology fields. Subsequently, the questionnaire was finalized for distribution.

#### 3.6.2 Reliability

It means the consistency and stability of the questionnaire, or its ability to measure the concepts consistently over time within the same circumstances, and under the same conditions. For testing reliability, this study used *Cronbach's alpha coefficient* to evaluate the internal consistency of the survey questions.

Table 5. Cronbach's Alpha Coefficient for the Questionnaire Items Reliability

Group	No. of Items	Cronbach's Alpha Coefficient for Frequency Occurrence	Cronbach's Alpha Coefficient for Severity Occurrence	Cronbach's Alpha Coefficient
Team Factors	4	62.7	58	76.9
Project Management Factors	4	72.8	68.4	82.1
Organizational Factors	6	73.2	64.4	82.3
Environmental Factors	4	60	60	75.3
<b>All</b>	<b>18</b>	<b>84</b>	<b>84</b>	<b>91.7</b>

As indicated in the above table, Cronbach's Alpha Coefficient showed a high value for each item (between 58 and 82.1). The Cronbach's Alpha value for the total questionnaire is 91.7. Thus, the questionnaire achieved a high reliability based on the questionnaire responses, as the minimum Alpha value for business research to achieve reliability equals to 60% and above.

## 4. Data Analysis And Discussion

This section discusses data analysis and results which were collected through the survey. It contains a description about the IT companies' characteristics , CEOs and project managers , project success criteria, the used information systems, the descriptive statistical analysis used and the results related to the success in the information technology companies in Jordan. For each success factor, the frequency and severity were analyzed. Success factors importance and severity were determined according to the CEOs and project managers' points of view. Moreover, success factors groups' importance and severity were determined. Also, success factors orders were identified. Finally, the hypothesis of the study, which refers to the agreement between study parties on the order of importance for each of the success factors analyzed.

### 4.1 Company Characteristic Description:

In this section, we describe the characteristics of the (59) IT companies that participated in the study.

Table 6 summarizes these characteristics which include the forms of the organization, number of employees, the companies age, domain, target sectors, types of the products and services provided by the companies, and finally the reasons behind dealing with outside contractors, if exist. As appears in table 6, IT companies' structure has three forms: functional structure, project structure and matrix structures. The structure of the organization follows the nature of the products and services it provides.

Table 6. Companies Characteristics

Characteristic	Category	Frequency	Percentage (%)
Structure forms	Functional	48	53.3%
	Project	23	25.6%
	Matrix	19	21.1%
The number of employee organization	25 and less	43	47.8%
	26-100	32	35.6%
	101 and above	15	16.7%
How long has the organization been in business?	5 years and less	28	31.1%
	6-10 years	14	15.6%
	11 years and above	48	53.3%
Domain	Products	30	33.3%
	Services	68	75.6%
	Solutions	41	45.6%
	Training	24	26.7%
	Consultants	17	18.9%
Target sectors	Government	51	56.7%
	Public Safety	20	22.2%
	Healthcare	27	30%
	Education	40	44.4%
	Smart Grid	11	12.2%
	Energy	19	21.1%
	Transportation	15	16.7%
	Finance	35	38.9%
	Manufacturing	20	22.2%
	Hospitality	23	25.6%
	Media	21	23.3%
	Entertainment	18	20%
Product and service types provided by the organization	Application and software	65	72.2%
	Server	17	18.9%
	Storage	11	12.2%
	Data communication	15	16.7%
	Networking & Security	21	23.3%
	Cloud Computing	6	6.7%
	Data Centers	12	13%
	Development of application software	30	33.3%
	Systems integration services	19	21.1%
	Training and consulting services	24	26.7%
Reasons for dealing with outside contractors	Low cost	25	27.8%
	Speed	22	24.4%
	Technical reasons	45	50%

For the companies that provided hardware, the functional structure is applied. The companies' structure is divided into main departments such as: marketing, sales, human resource and the technical department (which includes sections like database, networking, development and graphic design). For the companies that provide different services and solutions, a project manager is allocated to each project. For the large companies that produce several products, services, training and solutions, the matrix structure is applied. Having a matrix structure, there are known departments in addition to a group of project managers for each project.

As mentioned in table 6 the majority of IT companies follow the functional structure with a percentage of (53.3 %). Others follow the project structure with a percentage of (25.6 %), and (21.1%) follow the matrix structure.

With respect to the number of employees; most companies (47.8%) employ 25 and less individuals as project manager, technical manager, technicians, engineers, secretaries, administrators. Only (16.7%) have a high number of employees (101 and above). There are about (35.6%) of companies own between 26 and 100 employees. It's important to mention here that some companies have only one employee; the CEO who is the owner of the company and does all the needed tasks.

Considering the IT companies experience, most of them seem to be old (53.3%) and (31.1%) of the companies have ages below five years. While (15.6%) have ages varying between five and six years. As noticed



from interviewing some companies' manager and CEO some companies started their business looking for short term profit, without concentrating on long term strategies. So, through periods of time, a large number of companies failed and closed their business, while others opened new companies.

IT companies' domains include: products (hardware and software) services for other companies like data entry and test banks, solutions as A registration system for universities, training in the needed systems or programs like oracle and consultants which contains presenting the best views and solutions about any IT problem.

Some IT companies are specialized in only one or two of the IT domains. As appears in the following table, 5 companies present only products, 23 provide only services, 10 only solutions, 2 present training only and only one company provides only consultants. The others offer a combination between products, services, solutions and consultants, as appears in table 6. Most companies (75.6%) introduce services, (45.6%) present solutions, (33.3%) introduce products, (26.7%) present training, and only (18.9%) present consultants.

IT companies present the mentioned products and services for many sectors starting from government and ending with entertainment. Of course, most companies produce their services to more than one sector. The sector that is served by the company differs according to the bundle of its products and services. As appears in table 6, government is the most targeted sector (56.7%), followed by education (44.4%), finance (38.9%), healthcare (30%), hospitality (25.6%), media (23.3%), (22.2%) of companies serve manufacturing sector, and the same percentage serve public safety. About (21.1%) companies produce their products and services to the energy sector, (20%) for entertainment, (16.7%) for transportation and (12.2%) for smart grid.

There are different kinds of products and services provided by the companies; application and software, server, storage, data communication, networking, cloud computing, data centers and the development of application software.

As noticed from table 6, most IT companies (72.2%) provide application and software, followed by development of application and software (33.3%), then training and consulting services (26.7%), networking and security (23.3%), system integration services (21.1%), server (18.9%), data communication (16.7%) followed by data centers (13.3%), then the storage (12.2%) and finally cloud computing (6.7%).

Some companies (approximately 70% of companies) deal with outside contractors to assist them in achieving some of their tasks for many reasons. For instance, (27.8%) depend on contractors to get a lower cost. Lower cost can be achieved for instance by depending on temporary staff to achieve work using experts to provide some inputs for products or services with lower cost. There are (24.4%) of companies deal with contractors to achieve their work more quickly, (50%) for technical reasons.

Table 7. Companies that Provide Only One Domain

Category	Number
Only products	5
Only services	23
Only solution	10
Only training	2
Only consultant	1

#### 4.2 Demographic Characteristic of the Respondents:

Table 8 presents the respondent's position in the organization (CEO/ Project manager), their years of experience in the information technology sector and in the current position.

Table 8. Respondent Characteristics

Characteristic	Category	Frequency	Percentage (%)
years of experience in the information technology sector	Less than 5 years	18	20%
	5 to less than 10 years	31	34.4%
	10 to less than 15 years	21	23.3%
	15 years and more	20	22.2%
Position in organization	Project manager	53	58.9%
	CEO	37	41.1%
Years of experience do you have as a project manager/ CEO	Less than 5 years	42	46.7%
	5 to less than 10 years	29	32.2%
	10 to less than 15 years	11	12.2%
	15 years and more	8	8.9%

As shown in table 8, (90) respondent participated in the study; (41.1 %) are CEOs and (58.9 %) are project managers. The participation percentage variation is small, which helps in achieving to achieve the needed balance for the different opinions.

Regarding experiences in the IT sectors in general, the largest percentage around (34.4 %) has an experience between 5 and 10 Years. (23.3%) have between 10 and 15 years of experience. (22.2%) have 15 and

above years of experience, and only (20%) have less than 5 years. This seems to be good as the most respondents have a good experience in the IT sector in general.

It is important to mention that the experience of the respondents in their current positions varied, the majority (46.7%) have less than 5 years' experience. Followed by (32.2%) with experience between 5 to 10 years. For the number of years between 10 and 15, the percentage was (12.2%) and finally (8.9%) have 15 years' experience and above. This gives an indication about despite the majority of respondents have high number of experience years in the IT sector in general, they have lower numbers in their current position. This might be due to their continuous changes in positions looking for better offers in other companies both locally and internationally.

Table 9. Project Success Description

characteristic	Category	Respondents' opinions					
		CEO		Project manager		Total	
		Frequency	Order	Frequency	Order	Frequency	Order
Criteria to measure project success	Cost	15	4	31	4	46	51.1%
	Time	18	3	39	2	57	63.3%
	Quality of products and services	28	1	43	1	71	78.9%
	Client satisfaction	23	2	36	3	59	65.6%

#### 4.3 Project Success Description:

Several criteria are used to evaluate project success, its cost, completion time, the quality of products and services provided client satisfaction and many other criteria. Most companies (78.9%) consider quality of products and services as the main criteria to measure project success. Other companies depend on cost (51.1%), (63.3%) depend on time only, and (65.6%) considered client satisfaction as the major success criteria.

Table 10. The Ratio of Project Success in Company

Characteristic	Category	Respondents frequencies		
		CEO	Project manager	All
The ratio of project success in company	100%	9	11	20
	75 %	19	33	52
	50%	8	9	17
	25%	1	0	1
	Less than 25 %	0	0	0
Total		37	53	90

Respondents were asked to determine the ratio of project's success within their companies. About (22.2%) of companies mentioned that all their projects achieved success (100%) and this seems to be good according to their success criteria. But most companies (57.8%) said that 75% of their projects are considered to be successful, this seems to be more rational. (18.9%) of companies referred that only half of their projects are considered successful and only (1.1%) said that only 25% of their projects are successful.

Table 1. The Most Responsible Part of Project Success

characteristic	Category	Respondents' opinions						
		CEO		Project manager		Total		
		Frequency	Order	Frequency	Order	Frequency	Order	percentage
The most responsible for project success	Top management	12	2	21	3	33	3	36.7%
	Project manager	19	1	28	1	57	1	63.3%
	Team members	19	1	29	2	48	2	53.3%
	Technicians	9	3	19	4	28	4	31.1%
	Engineers	3	4	14	5	17	5	18.9%

Another question investigated the different parties could be responsible of the project success. These parties include top management, project manager, team members, the technicians, the engineers or any involved parties. There are 63.3% of companies refer that project managers are the most responsible for project success, followed by team members (53.3%), top management (36.7%), technicians (31.1%) and finally engineers (18.9%).

#### 4.4 Information System Description:

The following table presents the different types of information systems that have been used in the IT companies.

Table 12. Information System Types

Characteristic	Category	Frequency	Percentage %
Types of information systems that are used in companies	Data processing systems (DPs)	31	34.4%
	Management information systems (MIS)	29	32.2%
	E- Conferencing systems.	21	23.3%
	Expert systems (ES)	8	8.9%
	Communication systems (CS)	14	15.6%
	Decision support systems (DSS)	14	15.6%
	Human resources management systems	23	25.6%
	Office automation systems (OAS)	10	11.1%
	E-mail	56	62.2%
	Voice mail	9	10%
	Process control systems	12	13.3%
	Information reporting systems	15	16.7%
	Executive information systems (EIS)	3	3.3%
	Business function information systems	16	17.8%
	Strategic information systems	8	8.9%
	E-business (service)	35	38.9%
	Internet (web applications)	58	64.4%
	Databases	42	46.7%
Networking	45	50%	
Face book	24	26.7%	

Since ISs are considered to be the main output for any IT company, this study explores different types of information systems used by these companies. From table 12, it can be concluded that web applications and E-mail are the most produced information systems with 64.4% and 62.2 % in order, then networking (50%), databases (46.7%), E-business solution comes after that with 38.9%. Then, data processing systems is (34.4%), management information systems is (32.2%), Facebook is (26.7%), human resources management systems is (25.6%), and E-conferencing system is (23.3%). Many other information systems could be produced by companies like: Business function information systems is (17.8%), information reporting systems is (16.7%), communication systems and decision support systems with the same percentage is (15.6%), process control systems is (13.3%), office automation systems is (11.1%), voice mail is (10%), strategic information systems and expert system is (8.9%) and finally Executive information systems (EIS) is (3.3%).

Table 13. Importance Index and Factors Order According to the Respondents View.

No	Success factor	Group	Order	Importance index (I.I)%
1.	The project team consists of all the required functional areas	Team Factors	4	19.8
2.	The project team qualifications, knowledge, and technical abilities and skills are required in the project	Team Factors	2	20.7
3.	Project team introduces progress reports (e.g. Project stages, problems and achievements)	Team Factors	12	17.4
4.	Team leader possesses leadership and interpersonal skills that are needed to motivate project team and help them to resolve conflicts	Team Factors	6	19.1
5.	Project objectives are clear, well-defined and measurable	Project Management Factors	3	20.2
6.	Realistic budget is defined to projects	Project Management Factors	18	7.6
7.	Top management and team leader make the proper planning and forecasting for the projects	Project Management Factors	11	17.5
8.	Risk analysis is done at the start of the project	Project Management Factors	16	15
9.	Top management introduces the needed resources, support and required authority	Organizational Factors	7	19
10.	The company possesses the required infrastructure, equipment, and development expenses	Organizational Factors	9	18.1
11.	The company conducts continuous training for the employees	Organizational Factors	17	14.2
12.	The company established quality standards to monitor the process quality at the start of the project	Organizational Factors	14	16.5
13.	Top management and project leader possess effective standards, monitor the process and take enhancement decisions	Organizational Factors	13	16.6
14.	There is an effective communication between the project stakeholders in order to share necessary information	Organizational Factors	5	19.6
15.	There is a direct interaction with the client	Environmental factors	1	21.7
16.	The host organizational structure facilitates the implementation of the designed system	Environmental factors	8	18.4
17.	Customer requirements are clear and well-defined	Environmental factors	10	17.7
18.	The company uses minimum customization of the designed system to exploit its benefits	Environmental factors	15	15.9

#### 4.5 Success Factors

Based on the questionnaire, a group of success factors was found and studied based on their frequency and severities. This section discusses factors' frequency, severity, order, coefficient for the orders and finally hypothesis test.

##### 4.5.1 Frequency And Severity For The Success Factors:

In our study, the frequency and severity of occurrences for the success factors were measured by different statistical techniques such as averages, standard deviation and confidence interval. SPSS and Microsoft Excel have been used to analyze data for the variables.

The range of averages for the occurrence frequency is between 3.64 and 4.47 according to occurrence frequency measure. The range of averages for the severity occurrence is between 3.88 and 4.38 according to severity occurrence measure. The standard deviation for the occurrence frequency is between 0.640 and 1.003. The standard deviation for the severity occurrence is between (0.590 - 0.992), and finally the level of confidence is 95%.

##### 4.5.2 Success Factor's Importance According To the CEO and Project Manager Points of View

The importance index was calculated depending on equation 3 (see Section 3.5). According to CEOs, the

importance index between 4.08 and 13.4, while between 10.2 and 28.2 for project managers.

As appears in tables 13 CEOs and project managers agree upon some of the success factors and disagree upon others. Success factors were classified into four main groups. Hence success factors will be analyzed and discussed according to those groups. For discussion and analysis, factors will be evaluated according to their order depending on the importance index. Based on the respondent's point of view, factors which their order is between 1 and 6 are considered to be the most important factors. The factors with orders between 7 and 12 are important factors, and the factors with orders between 13 and 18 are the least important factors.

#### **4.5.2.1 Project Team Factors Group**

Teams are considered to be a main building block of project success. A team in all functional areas must own the needed qualifications and skills. CEOs give more importance to those factors than project managers. Factors related to teams are presented according to the CEOs opinion. The most important factors are as follow:

- 1) The team leaders possess leadership and interpersonal skills that are needed to motivate project teams and help them to resolve conflicts.
- 2) The project team's qualifications, knowledge, and technical abilities and skills are required in the project. The important factors are: 1) the project teams involve people all the required functional areas, and 2) Project teams introduce progress reports (e.g. Project stages, problems and achievements) and there are no less important factors in this group.

On the other hand, according to the project managers, the most important factors are:

- 1) The project team's qualifications, knowledge, and technical abilities and skills are required in the project.
- 2) The project teams involve people all the required functional areas.
- 3) Team leaders possess leadership and interpersonal skills that are needed to motivate project teams and help them to resolve conflicts.

The important factor according to the project manager view is "Project teams introduce progress reports (e.g. Project stages, problems and achievements)". Moreover, there are no less important factors in this group.

#### **4.5.2.2 Project management factor group**

This group contains the factors numbered from 5 to 8 as illustrated in Table 13. Table 13 indicates that CEOs give the same importance to these factors as project managers. Table 13 presents that according to the CEOs opinion, the only most important factor is: Project objectives are clear, well-defined and measurable. It is the most important factor in all groups according to the project managers' point of view.

Top management and team leaders make the proper planning and forecasting for the projects considered to be an important factor. The least important factors are the following two factors:

- 1) Risk analysis is done at the start of the project.
- 2) Realistic budget is defined to projects.

According to the project managers, the most important factor is: project objectives are clear, well-defined and measurable. It is the most important factor in all groups according to the project manager point of view. Top management and team leaders make the proper planning and forecasting for the projects considered to be an important factor. The least important factors are: risk analysis is done at the start of the project, and realistic budget is defined to projects. So the CEOs and project managers share the similar tendencies toward project management factors.

#### **4.5.2.3 Organizational factors group**

This list contains the factors numbered from 9 to 13 as shown in Table 13. Table 13 indicates that CEOs give higher importance to these factors than project managers, because they are responsible for the overall organization and every part in it.

Factors are presented in Table 13 based on the CEOs opinion. The most important factors are the following: 1) top management and project leaders possess effective standards, monitor the process and take enhancement decisions, and 2) there is an effective communication between the project stakeholders in order to share necessary information.

In addition, the important factors from the CEO point of view are: top management introduces the needed resources, support and required authority, and the company establishes quality standards to monitor the process quality at the start of the project.

Also, the least important factors are the following: the company possesses the required infrastructure, equipment, and development expenses, and the company conducts continuous training for the employees.

On the other hand, according to the project managers, the most important factors are the following: there is an effective communication between the project stakeholders in order to share necessary information, and top management introduces the needed resources, support and required authority.

From the project's manager point of view, the important factor is: the company possesses the required infrastructure, equipment, and development expenses. The least important factors are: the company establishes quality standards to monitor the process quality at the start of the project, top management and project leaders

possess effective standards, monitor the process and take enhancement decisions, and the company conducts continuous training for the employees.

#### 4.5.2.4 Environmental factor group

This group involves the factors numbered from 15 to 16 as shown in Table 13. Table 13 mentioned that CEOs give higher importance to these factors than project managers, because they deal with the outside environment and try to make the needed balance to achieve success for this organization.

Table 13 presents the factors based on the CEOs opinion, the most important factor is the direct interaction with the client. In addition, the important factors are: customer requirements are clear and well-defined, and the host organizational structure facilitates the implementation of the designed system. Moreover, the less important factor is the following: "the company uses minimum customization of the designed system to exploit its benefits". In addition, and based on the project managers, the most important factors is: There is a direct interaction with the client, and it is considered to be the most important factor between all groups. The important factors are:

- 1) The host organizational structure facilitates the implementation of the designed system.
- 2) Customer requirements are clear and well-defined.
- 3) The company uses minimum customization of the designed system to exploit its benefits.

There are no less important factors

#### 4.5.3 Success factor groups' importance

The eighteen success factors were classified into four groups as mentioned by (Sudhakar, 2012): team factors, project management factors, organizational factors and environmental factors.

Importance index is calculated for each group depending on the importance average using two ways. *First*, without depending on the number of success factors, and the *Second* by taking the success factor number into consideration and according to the following equation:

$$\text{Weighting Average} = \text{Weighting Coefficient} \times \text{Group Importance Average}$$

Equation 4: Weighting Average

Whereas:

$$\text{Weighting Coefficient} = \text{Number Of Factors In The Group} / \text{Total Number Of Factors}$$

Equation 5: Weighting Coefficient

$$\text{Group Importance Average} = \sum \text{Importance index for factors in the group} / \text{Number of factors in a group}$$

Equation 6: Group Importance Average

Table 14 presents the Importance degree and order for the success factor groups.

Table 2. Importance Degree and Order for the Success Factor Groups

Successes factor groups	Importance degree and order by					
	CEO		Project manager		Total average	
	Important index average	Order	Important index average	Order	Important degree average	Order
Team factors	11.9	1	24.4	1	18.1	1
Project Management Factors	9.5	4	19	4	14.2	4
Organizational Factors	11.4	2	21.4	3	16.4	3
Environmental factors	11.2	3	23.5	2	17.4	2

As shown in table 14, there is an agreement between the two groups (CEOs and project managers) that the team factors group comes in the highest rank in the importance degree order. Also, both parties agree on that the project management factor group comes in the lowest rank in the importance degree order.

Regarding both of the organizational and environmental factor groups, there is a difference in the opinions. It might be due to the differences in the responsibilities and experiences between them. The following table presents the importance degree for each group, keeping in mind the number of success factors in each group.

Table 15. The Importance Degree for Every Group Taking In Mind the Success Factors Number in Each Group

Successes factor group	Number success factor	Weighting Coefficient	Importance index and order by					
			CEO		Project manager		Total average	
			Important index average	Order	Important index average	Order	Important index Average	Order
Team factors	4	0.2	2.6	2	5.4	2	4.04	2
Project Management Factors	4	0.2	2.1	4	4.2	4	3.1	4
Organizational Factors	6	0.3	3.8	1	7.1	1	5.4	1
Environmental factors	4	0.2	2.5	3	5.2	3	3.8	3

As appears in table 15 there is an agreement between the two groups (CEOs and project managers) about the fourth group's order. They agree that the organizational factors group comes in the first rank in the importance degree order, and the team factors group comes in the second rank. Also, there is an agreement between the two parties on that the environmental factors group comes in the third rank in the importance degree order, and that the project management factors group comes in the lowest rank.

It is obvious from table 15 that the Weighting Coefficient has a significant role in the groups' importance order; the most important group is the group which has the highest number of factors.

#### 4.6 Study Hypothesis Testing

The following hypotheses were used to determine whether the respondents significantly agreed or disagreed with the importance of each tested success factors in IT projects in Jordan.

**Ho: There are no statistically significant differences** in attitudes of CEOs and project managers toward critical success factors' importance in IT projects in Jordan at the level of significance  $\alpha=0.05$ .

And a *t-test* paired was used to examine the above hypothesis.

The following table represents *t-test* paired result.

Table 16. T-Test Result to Accept or Reject the Null Hypothesis

Variable	Mean	Standard deviation	Correlation	t	Degree freedom (df)	Sig (2-tailed)
CEOs and project managers	0.333	0.3581	.741	.395	17	0.698

The significance value was 0.698, which is more than 0.05 as appeared in table 16. Thus, null hypothesis was accepted. Furthermore, Pearson correlation was used to evaluate whether there was a statistically significant relationship between respondent's attitudes about the success factors order. The result confirmed such a correlation, as the correlation value was (0.741). This clarifies a strong and positive correlation between the two groups.

#### 4.7 The Most Important Success Factors:

As appears in table 17, CEOs and the project managers have different ranks for determining the most important ten success factors. The most important five success factors based on the CEOs point of view are as follows:

1. Project objectives are clear, well-defined and measurable.
2. Team leaders possess leadership and interpersonal skills that are needed to motivate project teams and help them to resolve conflicts.
3. There is a direct interaction with the client.
4. The project team's qualifications, knowledge, and technical abilities and skills are required in the project.
5. Top management and project leader possess effective standards, monitor the process and take enhancement decisions

The most important five success factors based on the project manager's point of view are as follows:

1. There is a direct interaction with the client.
2. The project team qualifications, knowledge, and technical abilities and skills are required in the project.
3. The project teams involve people of all the required functional areas.
4. There is an effective communication between the project stakeholders in order to share necessary information.
5. Top management introduces the needed resources, support and required authority.

Table 17: The Most Important Success Factors According to CEOs and Project Managers

No	Success factor	CEO Order	PM order
1	Project objectives are clear, well-defined and measurable	1	4
2	Team leader possesses leadership and interpersonal skills that are needed to motivate project team and help them to resolve conflicts	2	6
3	There is a direct interaction with the client	3	1
4	The project team qualifications, knowledge, and technical abilities and skills are required in the project	4	2
5	Top management and project leader possess effective standards, monitor the process and take enhancement decisions	5	14
6	There is an effective communication between the project stakeholders in order to share necessary information	6	4
7	Top management introduces the needed resources, support and required authority	7	5
8	Customer requirements are clear and well-defined	8	9
9	The host organizational structure facilitates the implementation of the designed system	9	7
10	The project team consists of all the required functional areas	10	3
11	Top management and team leader make the proper planning and forecasting for the projects	10	10
12	The company established quality standards to monitor the process quality at the start of the project	11	13
13	Project team introduces progress reports (e.g. Project stages, problems and achievements)	12	11
14	The company possesses the required infrastructure, equipment, and development expenses	13	8
15	The company conducts continuous training for the employees	14	16
16	The company uses minimum customization of the designed system to exploit its benefits	15	12
17	Risk analysis is done at the start of the project	16	15
18	Realistic budget is defined to projects	17	17

## 5. Conclusions And Future Work

This section presents the conclusions of this study. Moreover and based on these conclusions, we summarize a number of recommendations that IT companies in Jordan must follow for a successful project. In addition, we suggest a number of ideas for future work.

Recently, there has been great attention to the development of IT products worldwide. However, there are many challenges that face the development of IT projects and a great number of projects face failure in terms of exceeding budget or not meeting strict deadlines or not matching the customer requirements. This was a major inspiration for us to examine the success factors of software project and to try to draw a framework for a successful project.

There has been a number of research works that studied the success and failure of software projects. We have extensively studied these works and summarized them in section 2 where majority of the previous works have focused on summarizing or surveying past works. Different from the past works in this field, 18 success factors which considered being critical, were investigated and classified into groups and arranged according to their importance from both the viewpoints of the project manager and the CEO of the company. Moreover, our work is the first to study this problem within the Jordanian IT companies. The result of the study may be implemented in other countries with similar culture and economic circumstances.

In our survey, 90 respondents have been studied and statistically analyzed from 59 Information Technology companies in Jordan. Among the studied respondents, 55 were CEOs and 45 were project managers. IT companies in Jordan seem to be longstanding in business, follow a functional structure which reflects a common project organization structure for IT companies in Jordan and generally, they have a small number of employees. Project success can be achieved through concentrating more on the services especially to the government and education sectors, as most IT companies produce services. A great attention must be paid to time constraints which dominate the project success criteria.

Among the important lessons derived from this study, careful consideration by IT companies must be taken to technical aspects of software production to reduce companies' dependence on outside contractors. Add to the above, PMs are considered to be the most responsible part for project success and thus, there must be high efforts in professionally developing PMs abilities and skills,

It is obvious that the following factors are correlated to project success according to the CEO point of



view: the project objectives must be clear, well-defined and measurable, and the team leader have to possess leadership and interpersonal skills that are needed to motivate project team and help them to resolve conflicts and there must be a direct involvement of the client.

From the project manager point of view, the following success factors are with the highest ranking: client interaction, a highly qualified project team with strong knowledge and technical abilities. Also, the project team must have skilled people from all the required functional areas of the project. These factors must be maintained in order to achieve a successful project.

There is an agreement between the project manager and the CEO on the team factors' group to be ranking the highest, and the project management factors' group to rank the lowest in terms of the importance degree. But there is no agreement between them about the importance of the organizational factors and environmental factors' groups. On the other hand, by taking in mind the number of factors in each group, there is an agreement between the two parties about the order of the four groups.

A clear outcome of this study is the obvious agreement between the two groups on the order of the critical success factors in the information technology projects in Jordan. This was evident through T-test paired results which show no clear conflict of interest between CEOs and project managers on the importance of critical success factors.

### **5.1 Recommendations**

Based on our study and our results, we can recommend a number of points for a successful project. Generally, comprehensive study and revision of existing projects is important for the identification of real success and failure reasons. It is important for the top management to give high attention to technical concerns in projects which are important to decrease dependence on outside contractors. Also, it needs to make sure that products are of a high quality by continues revisions and testing. For a successful project, the project manager and team members must be selected carefully and given the necessary training to avoid any delays during the project implementation. In addition, there must be a high focus on project management concepts such as scope determination, planning, forecasting and presenting progress report. Add to the above, there must be efficient regulations related to measurement of performance, teams' motivation, project monitoring, and supervision.

Customers are an important component for any successful project and they must be involved through the complete project. Their feedback is very important for building the right product and discovers problems in an early stage. In relation to customers, the customer role of facilitating the implementation of the system, by removing any administrative and bureaucratic barriers, can be very effective for the operation of the system.

Communication with the stakeholders is an important factor for a successful project as the project cannot succeed with the project manager alone. However, we must not disregard that the project manager should have the needed authority to take decisions. Underestimating the needed resource for the project can lead to a failure of the project and there must be enough resources for carrying out the project. Finally, the system must have minimum customization properties to ease their use in many ways.

### **5.2 Future Work:**

This study constitutes a baseline for further research that examines the roles and viewpoints of other stakeholders such as project engineers and team members in regard to the important factors for the success of software projects. Moreover, future work might include other industries in Jordan, rather than IT, to collect information on CSFs at a larger scale. The Relationship between CSFs could be studied to investigate how these factors interact with each other. Another possible future research direction is to investigate the impact of some variables such as company size, CEO and project manager's experience, employees' number and the project type on the software project success in Jordan. Add to the above, it might be interesting to study the relationship between success factors and in an individual basis for each of the following: time, cost or quality. A possible framework for CSFs can be built based on the project life cycle phases. In addition, further studies can be conducted to examine the effects of CSFs on other software development life cycle stages such as the design stage and not only being focused on the implementation stage. Also, effective set of strategies may be developed to enhance and maintain CSFs. Moreover, the data and results reported in this paper were based on a single country, Jordan, and in turn are applicable specifically to the Jordanian context. Thus, this raises inquiries regarding the generalizability to other cultures and different contexts. Consequently, further research is needed with regards to several countries in other Arab and non-Arab countries to enlarge the knowledge of such a topic in the future.

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