Routledge
Taylor & Francis Group

Journal of Global Information Technology Management

ISSN: 1097-198X (Print) 2333-6846 (Online) Journal homepage: https://www.tandfonline.com/loi/ugit20

An exploratory study of ICT projects failure in emerging markets

Shouki A. Ebad

To cite this article: Shouki A. Ebad (2018) An exploratory study of ICT projects failure in emerging markets, Journal of Global Information Technology Management, 21:2, 139-160, DOI: 10.1080/1097198X.2018.1462071

To link to this article: https://doi.org/10.1080/1097198X.2018.1462071

JOURNAL OF GLOBAL INFORMATION TECHNOLOGY MANAGEMENT
2018, VOL. 21, NO. 2, 139–160
https://doi.org/10.1080/1097198X.2018.1462071

Routledge
Taylor & Francis Group

An exploratory study of ICT projects failure in emerging markets

Shouki A. Ebad

Computer Science Department, Faculty of Sciences, Northern Border University, Arar, Saudi Arabia

ABSTRACT

Information and communication technology (ICT) projects still suffer from high failure rates, especially in emerging markets. This paper investigates existing trends and influencing factors for this failure in such a context, using a representative sample of organizations in Saudi Arabia (SA). To this end, two sources of data collection are used, a corporate survey on local and multinational organizations working in SA including a qualitative analysis of the participants' answers, and archival data of a real-world case study of a challenging software project. The management/organization factors including lack of planning, resistance to change, misunderstanding user requirements, government regulations, poor business process reengineering, and lack of training were found to be the key indicators that influence ICT project failures. However, technical factors (e.g. redesign required for government compliance such as the use of the Hijri calendar) and financial reasons tend to have reduced influence because of extensive government subsidization in such countries. To generalize our findings, we compare and discuss our results with another Middle Eastern market. The comparison found that the lack of planning is the most important factor of failure between the two countries. The results may also apply to other emerging markets.

KEYWORDS

Emerging markets; failure; information and communication technology (ICT); IT management; software project management

Introduction

With no doubt, information and communication technology (ICT) is becoming the backbone of many aspects of modern life such as business, health care, manufacturing, and education. ICT projects can be large or small and can involve one person or thousands of people (Schniederjans & Kim, 2003). Countless firms around the world have either implemented or are in the process of implementing ICT projects. If properly implemented, the benefits they yield are far more substantial, including cost reductions, improved user satisfaction, higher transparency, real-time information tracking, and organizational efficiencies, etc. (Baltzan & Phillips, 2015).

However, the "CHAOS 2012 report" by the Standish Group, a technology research firm,[1] found that 61% of these projects are unsuccessful (The Standish Group, 2012).[2,3] Although several studies have been conducted to identify the reasons behind such failures, the underlying reasons for failed ICT projects are not only divergent and complex but also lead to negative consequences for the companies involved. In the UK, substantial failures in software development efforts for the London Ambulance System, the Wessex Health Service, and Taurus Financial Services have been well documented and have resulted in huge costs (Remenyi, 1999). In the US, Hewlett-Packard (HP) lost USD 160 million in 2004 from development system failures (CIO Staff, 2007). Similarly, the Federal Bureau of Investigation (FBI) of the US government was forced to scrap its USD 170 million virtual case file (VCF) management system in 2005 (Afzal, 2014). Elsewhere in the world, in 2014, the Japanese automaker, Toyota, announced a recall of its Prius vehicles to fix a software glitch that

CONTACT Shouki A. Ebad shouki.abbad@nbu.edu.sa Computer Science Department, Faculty of Sciences, Northern Border University, Saudi Arabia.

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/ugit.

could cause its cars to stall (Hirsch, 2014). The same, if not worse, happens in emerging markets. Emerging markets are countries that have some characteristics of developed markets, but do not meet the standards of developed markets (MSCI Inc., 2014). For example, Brazil and Peru (from America), Hungary and Poland (from Europe), and Turkey, Egypt and Saudi Arabia (SA) (from the Middle East) are emerging markets.[4] In fact, the majority of Saudi Arabian ICT projects in the hospital and healthcare sectors have been classified as failed projects (Abouzahra, 2011). Brazil, another emerging market, suffers from the issue (Coakes, Amar, & Granados, 2013). The same happens in frontier markets, developing countries with slower economies than emerging ones, such as Jordan[5] (Abu-Shanab & Al-Saggar, 2013). Therefore, the issue is commonplace throughout the world, ranging from developed to emerging to frontier markets. The problem is not domain-specific; failures have been found in diverse domains including education (Alami, 2016; Wailgum, 2005), air transportation (Bailey, 2007), postal services (Bouras & Bendak, 2014), government (Alami, 2016), and the military (McQuaid, 2012). These are only a few examples of high-profile ICT project failures reported in the literature. Meanwhile, it is difficult to obtain agreement concerning the global failure factors because of differing viewpoints; what US organizations consider failure, Chinese or European organizations, for example, may not. There is little agreement even among organizations within the same country—or often even among people within the same organization (Al-Ahmad et al., 2009; Dwivedi et al., 2015; Glass, 1999). The differing perspectives of people within an organization are a prime cause. For example, while software developers might assess a software project as a success, other stakeholders might consider it as a failure, illustrating potential chasms between various people both inside and outside an organization. Moreover, while the term "failure" (and "success" for that matter) is well-known and widely used, it is tricky and difficult to define.

Several Middle Eastern emerging markets such as SA, Qatar, and the United Arab Emirates (UAE) have recently focused on removing their dependence on oil. For this, the ICT industry would play an important role in these markets in the near future (Rasooldeen, 2016). As with other emerging markets, SA allocates a large portion of its resources to develop ICT infrastructure with the aim of gaining a stronger foothold in the world economy but existing studies indicate a high rate of failure for ICT projects in the country. Knowing the failure rate will let ICT firms in emerging markets benchmark their performance to see how they compare to develop ones in the industry.

Given these kinds of problems and causes related to ICT project failures, this research seeks to understand the influencing factors for ICT project failure in emerging markets. The key research question (RQ) explored by this paper is: What are the major factors influencing ICT project failure in emerging markets? In order to answer this question, three investigation strategies are used: (a) a wide questionnaire-based survey was conducted with local and multinational firms working in emerging markets using a representative sample of SA organizations; (b) a qualitative analysis for commenting of the participants' answers; and (c) a real-world case study of a challenged software project from the market. SA is especially suited for a study aiming to highlight such factors, as its ICT sector has received more governmental subsidization than any other Middle Eastern emerging market, as we explain in the next section. In addition, we compare and discuss our findings with a relevant market (Iraq) in the same region. Our study is expected to be beneficial because no one, to the best of our knowledge, has yet addressed the failure issue by presenting a real-world software project case study from SA. Moreover, our study can generally assist ICT people, including project managers, researchers, engineers, developers, and vendors. It can also serve as a source of information and insight for top managers, and others in leadership positions, to reference in their effort to leverage the benefits of ICT projects in their organizations.

ICT sector in Saudi Arabia

Saudi Arabia (SA) has both one of the highest gross national incomes per capita and one of the highest per capita expenditures on ICT. The economy is stable and strong but it is dependent on oil. The ICT sector is growing and contributes significantly to the gross domestic product (GDP) of SA.

It is expected to expand over the next years and grow various aspects of ICT, including e-services, software markets, and wireless broadband networks (Saudi Gazette, 2015). BMI Research[6] has reported that the SA ICT sector is forecast to grow over the next few years (BMI Research, 2016). Recently, the level of e-government infrastructure development in SA showed significant improvement globally (United Nations, 2014). The report determines the ranking of countries based on online services available, telecommunications infrastructure, and human capital. Currently, SA is among the top 20 emerging e-government leaders.

Literature review

This section surveys the existing works that identify the factors of ICT projects failure in developed, emerging, and SA markets, and concludes with general comments on the existing works. Reviewing the literature on the global collective experience will help in identifying the gap between SA and other emerging markets, and between the emerging markets and developed ones in implementing ICT projects and observing its expected benefits.

Failure in developed markets

Lemon, Liebowitz, Burn, and Hackney (2002) distributed a survey on private and public companies in the US and Australia to find the factors influencing information systems (IS) project failure. The Australian respondents were more concerned with establishing project expectations from the beginning of a project while the US participants placed a premium on the planning process. End-user involvement and executive management involvement were two key indicators influencing projects in both the countries. Xia, Yu, Lim, and Hock (2010) developed a comprehensive and an effective approach that addresses critical decisions for a successful enterprise resource planning (ERP) implementation in small and medium enterprises (SMEs) in Singapore. This was done through identifying eight factors: powerful business case, vision clarity, change leadership and accountability, change-specific communication, increased change capability, integrated planning and teams, stakeholder commitment, and aligned performance and culture. Coakes et al. (2013) conducted a global survey of the users of the knowledge systems (KS). The survey was conducted from 2007 to 2011 of 1034 participants from 76 countries; responses came from 13 countries: US, UK, Australia, India, Canada, Brazil, Bulgaria, France, Latvia, Netherlands, Pakistan, Philippines, and Sweden. The results showed that human and organizational barriers prevented the systems from being used to their full potential. The authors recommended that users are integrated into the design team to address these barriers early. Afzal (2014) analyzed the reasons behind the failure of the US FBI's VCF system (mentioned in Section 1) that was developed in 2000 and discarded in 2005. The author concluded that poor communication among key users, insufficient resources, unrealistic schedule of deadlines, inappropriate training, and unclear and ambiguous requirements were the main factors behind the failure of VCF. Doraiswamy and Shiv (2012) highlighted many of the challenges facing a software project manager during the course of a project. The main issues that can derail a project were unclear requirements, scope creep, and undefined roles. According to Mieritz (2012), Gartner conducted a survey to provide insights into ICT project performance in organizations across North America, France, Germany, and the UK. The study showed that there was a relationship between failure and project size; large ICT projects with budgets exceeding USD 1 million are more likely to fail than small projects with budgets below USD 350,000. Lehtinen, Mäntylä, Vanhanen, and Itkonen (2014) conducted a root cause analysis on four software companies to find the failure causes and their relationships. As a result, 50% of the causes were found to be interconnected with the process areas. Alami (2016) identified the failure factors through analyzing two real cases: the e-Borders project in the UK and the instructional technology initiative (ITI) by the Los Angeles Unified School District in the US. The main reasons were: (1) IT projects cannot

survive in their ecosystems[7]; (2) transformations are endeavored according to roadmaps instead of schedules; and (3) poor project management (PM) practice.

Failure in emerging markets

Wang, Shih, Jiang, and Klein (2008) examined several factors that have a positive impact on successful ERP. From a survey of 90 manufacturing firms in Taiwan, the results showed that the *consistency* concept had a significantly positive impact on the ERP implementation success. Chatfield and Alhujran (2009) conducted a cross-country comparative analysis of e-government websites and portals in 16 Arab countries to assess their development stages in e-government service delivery capability. The results showed that a *wide digital divide* still exists between the Arab countries and the leading developed countries, and among the Arab countries studied. Although its corporate headquarters are in California, the company that was chosen as a case study (Chen, Law, & Yang, 2009) has a broad base in Southeast Asia. The authors carried out a case study of the California-based multinational company and approach the issue of ERP implementation from a PM perspective. The lessons learned were reported from the failure of the first implementation to the success of the second one. It was shown that better management for PM areas contributed to the success. In Malaysia, Maidin and Arshad (2010) developed a theoretical model of IT governance practices in IT project approval and implementation in the public sector. The model consists of eight elements: senior management involvement, corporate performance measurement system, strategic alignment, risk management, value delivery, resource management, ethics/culture, and a corporate communication system. Nwakanma, Asiegbu, Ogbonna, and Njoku (2013) discovered that six critical success factors (CSFs) had a collective effect on the implementation of IT projects in Nigeria. Namely, clear requirements, clear objectives, a realistic schedule, PM methods/skills, top management support, and user involvement. In Jordan, Abu-Shanab and Al-Saggar (2013) probed 95 IT specialists to understand the perceptions towards the factors that lead IT projects to fail or escalate. Results indicated that poor planning was the highest perceived reason behind the failure of IT projects. On the other hand, the lowest perceived factor influencing IT project success was conflicts in ideas and opinions between team members. In North Africa, Bouras and Bendak (2014) performed a small-sized study aimed at determining the causes of IT project failures in a postal services company. Results showed that the main reasons were lack of a business plan and poor documentation during and after finishing projects, lack of clear quality assurance criteria, standards and reviews, and poor PM practices. Mo and He (2015) employed the four-step problem-solving case study approach to guide students in a class to identify the case problem of ERP implementation failure in a Chinese company, analyze its causes, and develop a detailed action plan to solve the problem. The authors suggested that the company take some actions in the future such as creating more opportunities for employees to use computers, inviting managers who implemented ERP successfully to share their experiences, and inviting vendors who had successful experiences in customizing systems to talk about their attempts.

Failure in Saudi Arabia

Abouzahra (2011) studied causes of failure of 29 healthcare information systems (HISs) in hospitals. The author found that the important causes of failure were unclear scope, undefined risks, undefined stakeholders, and communication. Aldayel, Aldayel, and Al-Mudimigh (2011) used a questionnaire to identify CSFs of the implementation of ERP. The results showed that PM, system selection, and training were the important factors in success. Al-Turki (2011) identified the factors affecting successful implementation of ERP systems in local businesses. Key factors of success were found to be human-related factors, such as leadership, change management, and training. Alfaadel, Alawairdhi, and Al-Zyoud (2012) found that the reasons

of failure were unclear, incomplete requirements, organizational culture, conflict of interest, and poor planning. In contrast, the important CSFs were: a clear statement of requirements, top management support, and proper project planning. Al Sharief (2012) discovered that the major factors influencing the implementation of the e-government projects were citizen's trust in e-government challenges, legal and regulatory challenges, and information/data challenges. Similarly, Alfarraj, Alhussain, and Abugabah (2013) identified the factors influencing the implementation of e-government projects. The critical one was the cooperation/collaboration within the organization and between the organizations. From the perspective of chief information officers (CIOs), Almajed and Mayhew (2013) discovered that the critical factors of the IT projects success were organizational, process management, and resource management factors. Altahtooh and Emsley (2013) found the role of a project management office (PMO[8]) on IT projects success and failure. Three main findings were: (1) PMO was not implemented by most IT management; (2) organizations that establish a PMO differ from those that do not; and (3) project time and cost are not affected by the variables: experience, funding, number of staff, and location. Saleh, Abbad, and Al-Shehri (2013) conducted a study to find the CSFs of ERP implementation. They found four factors: vendor support, consultant competence, business process reengineering (BPR), and user support. Alateyah, Crowder, and Wills (2013) used an online questionnaire on government employees. The authors found that the important challenges facing the adoption of an e-government were: quality of service, diffusion of innovation, computer and information literacy, culture, lack of awareness, technical infrastructure, website design, security, privacy, and trust. Almajed and Mayhew (2014) compared the CSFs for IT projects in SA and those in Malaysia. As a result, success in both the countries was influenced by PM and not by project team competency. Also, success was influenced by top management support in SA while communication management in Malaysia. Altahtooh and Emsley (2015) classified the risk factors of IT project failure in different groups. As a result, very high-risk factors were found in two groups: the project execution stage and the planning stage. A critical comparison of the studies conducted in the SA context is found in Ebad (2016).

General comments

Table 1 summarizes the key findings of all the studies mentioned in the previous sections. In conclusion, working with a challenged real-world software failure case from the private sector or industry is a common problem in much IT research (Dieste, Juristo, & Martínez, 2013). The real data of the failure cases should—at minimum—be available for research purposes, especially if the failures happened a few years in the past, thus eliminating any side effects of providing the researchers with the information needed to study them. Despite that all the studies discussed the high failure rate of ICT projects in SA, no study presented any failure case of a real project even by the organization that experienced the failure. Compared with the questionnaire-based approach that almost all the reviewed studies used, using a real-world system leads to uncovering the true negative consequences for the firm, for other projects, and for the people involved in the project. Addressing this problem using questionnaire-based studies is not enough because these types of studies may accurately reflect opinions and points of view, but cannot address the "why" and "how" questions like the case study approach that addresses ICT project failure as a phenomenon. This approach has a greater opportunity to convert future potential failures into successes and to highlight a significant difference between emerging markets and developed ones like the US that published far more information about real-world failure systems in both the public and private sectors (see for example, Afzal, 2014; Bailey, 2007; CIO Staff, 2007; McQuaid, 2012). Therefore, while it is easy to find SA studies that mention financial impacts in dollar terms for failure cases that occurred in other countries, such as the US or European countries (Almajed & Mayhew, 2013), such studies do not show equivalent information for SA. This research tries to fill the above gaps using three strategies: (a) conducting a

Table 1. Summary of the related work.

#	Market	References	Country	Factors	Type
1	Developed	Lemon et al. (2002)	US, Australia	End user involvement, executive management involvement	IS
2		Xia et al. (2010)	Singapore	Powerful business case, vision clarity, change leadership & accountability, change specific communication, increased change capability, integrated planning & teams, stakeholder commitment, aligned performance & culture.	ERP
3		Coakes et al. (2013)	US, UK, Australia, India, Canada, Brazil, Bulgaria, France, Latvia, Netherlands, Pakistan, Philippines, and Sweden	Human barriers, organizational barriers	KS
4		Afzal (2014)	US	Poor communication among key users, insufficient resources, un-realistic schedule of deadlines, inappropriate training, unclear & ambiguous requirements	Legal project
5		Doraiswamy and Shiv (2012)	N/A	Unclear requirements, scope creep, undefined roles	SW project
6		Mieritz (2012)	North America, France, Germany, UK	Project size	
7		Lehtinen et al. (2014)	Unknown	Process area-related factors	SW project
8		Alami (2016)	US, UK	Ecosystem survival, transformations, poor PM practice	Legal & education
9	Emerging	Wang et al. (2008)	Taiwan	Consistency concept	ERP
10		Chatfield and Alhujran (2009)	16 Arab countries	Wide digital divide	e-govt.
11		Chen et al. (2009)	Southeast Asia	PM practice	ERP
12		Maidin and Arshad (2010)	Malaysia	Senior management involvement, corporate performance measurement system, strategic alignment, risk management, value delivery, resource management, ethics/culture, corporate communication system	IT Project
13		Nwakanma et al. (2013)	Nigeria	Clear requirements, clear objectives, realistic schedule, PM methods/skills, top management support, user involvement	IT project
14		Abu-Shanab and Al-Saggar (2013)	Jordan	Poor planning	IT project
15		Bouras and Bendak (2014)	North Africa	Lack of business plan, poor documentation, lack of quality assurance criteria, standards & reviews, poor PM practices	IT project
16		Mo and He (2015)	China	Lack of sharing experience, communication with successful companies	ERP
17	SA	Abouzahra (2011)	SA	Unclear scope, undefined risks, undefined stakeholders, communication	HIS
18		Aldayel et al. (2011)		PM, system selection, training	ERP
19		Al-Turki (2011)		Leadership, change management, training	ERP
20		Alfaadel et al. (2012)		Unclear/incomplete requirements, organizational culture, conflict of interest, poor planning	IT project
21		Al Sharief (2012)		Citizen trust, legal & regulatory, information & data challenges	e-govt.
22		Alfarraj et al. (2013)		Cooperation/collaboration	e-govt.

(*Continued*)

Table 1. (Continued).

#	Market	References	Country	Factors	Type
23		Almajed and Mayhew (2013)		Organizational factors, process management factors, resource management factors	IT project
24		Altahtooh and Emsley (2013)		PMO	IT project
25		Saleh et al. (2013)		Vendor support, consultant competence, BPR, user support	ERP
26		Alateyah et al. (2013)		Quality of service, diffusion of innovation computer & information literacy, culture, lack of awareness, technical infrastructure, website design, security/privacy/trust	e-govt.
27		Almajed and Mayhew (2014)		PM skills, top management support	IT project
28		Altahtooh and Emsley (2015)		Execution stage factors, planning stage factors	IT project

wide corporate questionnaire-based survey with local and multinational organizations working in SA; (b) a qualitative analysis on the comments of participants; and (3) presenting an industrial case of a challenged software project from the public sector. Moreover, a comparison of our findings with another emerging market, Iraq, is made. The results of these strategies are analyzed and discussed in this paper.

The questionnaire-based survey

A questionnaire-based survey was used for collecting information from people to describe, compare, or explain their knowledge and behavior (Fink, 2003). It can be seen as a snapshot of the situation to capture the current status (Wohlin et al., 2012). Our method herein is similar to that of many other studies investigating ICT project failures (for example, Al-Turki, 2011; Bouras & Bendak, 2014; Chatfield & Alhujran, 2009; Coakes et al., 2013).

Survey approach

Our survey was based on a questionnaire designed to investigate the influencing factors for failure, which include managerial, technical, and financial aspects. The questionnaire consisted of three parts. Part 1 was to gather information about participants, such as the participant's job title and organization's information. Part 2 asked the participants to rate 18 factors related to reasons for ICT project failure utilizing a 5-level Likert scale (strongly disagree, up to strongly agree). Part 3 included one open optional question that asks participants to add more comments or factors; the answers of this part are analyzed qualitatively in the next section. The questionnaire was used for a comprehensive survey conducted over nine months between 2015 and 2016. Most of the participants were from top and middle management of the targeted organizations, which were ranging from local to foreign to multinational and from conglomerates to SMEs. We then analyzed the collected questionnaires using descriptive statistics and cross tabulation for multifactor analysis.

Survey description

Throughout surveying existing related work on factors of the ICT projects failure, such as Abu-Shanab & Al-Saggar (2013); Al-Ahmad et al. (2009); Altahtooh & Emsley (2015), we identified 18 factors that can be used as core factors in our survey as follows:

1.	Poor communication
2.	Failure to identify all stakeholders
3.	Misunderstanding user requirements
4.	Lack of planning
5.	Unrealistic time schedules
6.	Unrealistic cost estimates
7.	Unclear objectives
8.	Lack of user participation
9.	Conflict between users
10.	Lack of top management support
11.	IT staff turnover
12.	Inexperienced IT staff
13.	Resistance to change
14.	Using inappropriate testing tools
15.	Using new technology
16.	Poor quality code
17.	Lack of resources
18.	Size of project

Clearly, most of the above factors are managerial and organizational factors. Our literature (Section 3) found that management and organizational factors are more critical in the real-world failure or success of ICT projects than technical or financial factors. All chosen participants had contributed to ICT projects in the SA context. According to the nature of the sector, the largest numbers of responses (88%) were from private organizations followed by public establishments with 12%. The targeted organizations varied in size, activity, ownership, and geographical locations in the country.

The questionnaires, together with a cover letter explaining the purpose of the study, were emailed to the targeted people. Invitations were submitted to around 160 of the interested people by email; sometimes it was by hand in order to maximize the response rate. A total of 67 questionnaires were returned, of which 7 were incomplete leaving 60 for the analysis (a response rate of 37.5%). The high response rate could be attributed to both the level of interest in the subject or the direct and personal/email approach used by the researcher. More than half (53%) of the participants were middle management employees and 23% of them were leaders or top management employees. The remaining participants were from other professions, including engineers. Following the data collection, the responses were coded to enable them to be computer processed. Microsoft Excel was used for the analysis purpose.

Survey results: analysis and discussion

Before going into the survey results in depth, we should first note that there is an interest in tackling the area of ICT project failure on the part of the ICT community. This is indicated by the adoption of a number of standards and legislations for ICT aspects in SA, such as those related to the Yesser program.[9] The results of the survey are analyzed in terms of the factors mentioned in Section 4.2. We rate these factors to find the most and least important factor(s) from the viewpoint of the targeted people. The Likert scale was used where a value of 0, 0.25, 0.5, 0.75, and 1 indicated, respectively, "strongly disagree," "disagree," "neutral," "agree," "strongly agree." Table 2 summarizes the descriptive statistics for the 18 factors. It shows that the chosen factors were important with differential values. The overall average of means of all factors was 0.65 (i.e. between 'neutral' and 'agree'); where none was perceived to be low in influencing the failure of IT projects. In order to find the most influencing factors in failure, a single sample *t-test* method was used (Walpole, Myers, & Myer et al., 2011). The one-sided hypotheses are:

H0: $\mu < 0.5$ (null hypothesis)

H1: $\mu \geq 0.5$ (alternative hypothesis)

Figure 1 shows the *t-test* result.

Table 2. Descriptive statistics for each factor.

Factor	Min	Max	Mean	St.Deviation
Poor communication	0.00	1.00	0.74	0.23
Failure to identify all stakeholders	0.25	1.00	0.74	0.23
Misunderstanding user requirements	0.25	1.00	0.79	0.25
Lack of planning	0.25	1.00	0.76	0.21
Unrealistic time schedule	0.00	1.00	0.65	0.24
Unrealistic cost estimates	0.00	1.00	0.62	0.23
Unclear objectives	0.00	1.00	0.68	0.27
Lack of user participation	0.00	1.00	0.68	0.21
Conflict between users	0.25	1.00	0.65	0.24
Lack of top management support	0.00	1.00	0.65	0.27
IT staff turnover	0.00	1.00	0.62	0.27
Inexperienced IT staff	0.25	1.00	0.69	0.25
Resistance to change	0.25	1.00	0.77	0.22
Using inappropriate testing tools	0.00	1.00	0.55	0.25
Using new technology	0.00	1.00	0.43	0.26
Poor quality code	0.00	1.00	0.55	0.27
Lack of resources	0.00	1.00	0.63	0.27
Size of project	0.00	1.00	0.53	0.29
Overall average			0.65	

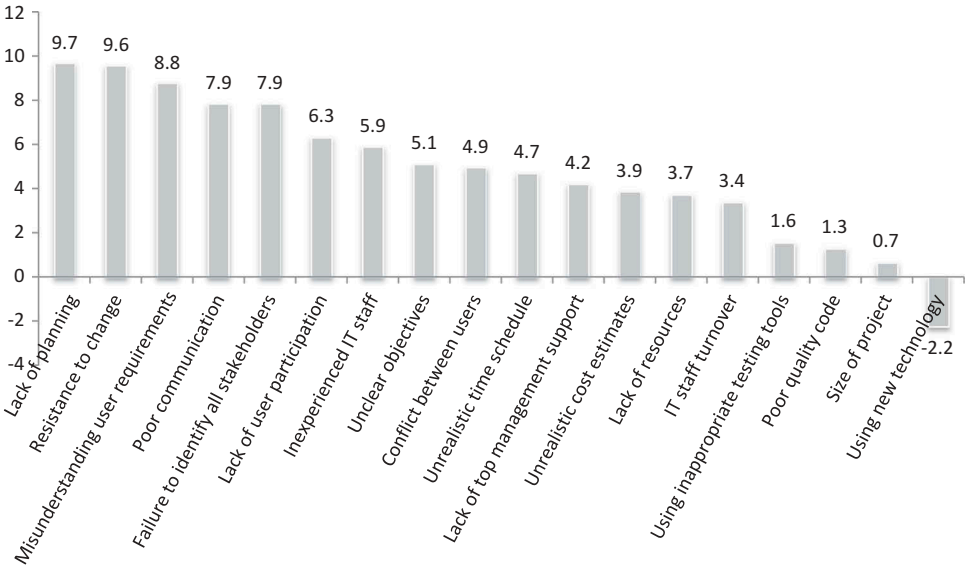

Figure 1. Factors ordered by t- degree (influencing).

From Figure 1, the results suggest that the most two important failure factors are management and organization related: 'lack of planning' and 'resistance to change' with degrees 9.7 and 9.6, respectively.

In general, the above result emphasizes the importance of PM process because the most important influencing factors are management and organization related. No doubt that the project planning (the first most important factor) is an important job of project managers. The main objective of planning is to establish a number of directions in detail that the project team can be told what must be done, when it must be done, and what resources to use in order to successfully produce project deliverables (Meredith & Mantel, 2006). Most, if not all, of other problems of ICT projects can be minimized or even eliminated with good planning that includes adoption of formal estimating techniques, periodical reports of both quantitative and qualitative data, collecting historical data

from similar projects, and improving quality control methods. Unfortunately, the PMO concept, which can improve the planning process, is still at an immature stage in the developing markets compared with the developed ones (Ebad, 2016). As in other Middle Eastern emerging markets, the business environment in SA is characterized by centralization and autocratic leadership. Such environments usually do not accept any change simply. For this, it is unsurprising for us that the 'resistance to change' is rated as the second most important factor in the failure of ICT projects. In such environments, the users or the experts (e.g. engineers and technicians) resist the changes because they see these changes as threatening their professionalism. We strongly advise the project manager to be sensitive to the feelings of the people affected when introducing change.

It is clear that technical factors that contribute to the failure of ICT projects including 'using inappropriate testing tools,' 'using new technology,' and 'poor quality code' were perceived to have low influence. Similarly, the financial factors, including 'size of project,' 'lack of resources,, and 'unrealistic cost estimates,' were not perceived to have a high influence on the failure. The low influence of financial factors might come from the strong financial capabilities in total and per citizen, as we mentioned in Section 2. It was also found that there is not a strong relationship between project size and the failure rate. This result contradicts a belief in the software engineering community that a small project is less likely to fail than a large one (Mieritz, 2012). This belief might come because the scope of small projects is often small and there is a little communication among the project's stakeholders so that they are easier to manage and execute. Our finding on project size does not differ much from similar studies conducted in developed markets (El Emam & Koru, 2008). From the cost ('unrealistic cost estimates') and time ('unrealistic time schedule') point of view, most participants showed these two factors had less influence on failure. This is because of the management style of big-sized private organizations that have joint ventures with multinational organizations and international projects outside SA. Their management style is reflected in their decision-making process.

Qualitative analysis of additional factors

In this section, we qualitatively analyzed the participants' answers to the following question (Part 3 in the survey):

"Do you have more comments?"

The answer to the above question was expected to address any missing factors we did not mention in Part 1. More than half (53%) of the participants answered the question. We excluded 33% of the answers because they were directly or indirectly associated with one or more of our factors listed in Section 4.2. We, therefore, focused on the remaining answers that address some additional factors including the following:

(1) *Government regulations*: several of the participants stated that the regulations of SA government lead to failure. As an example, Microsoft (MS) usually schedules visits of their engineers to customers to perform some needed tasks on MS products bought by the customer. Such tasks are necessary, especially if the customer is a large public organization. The engineer would not necessarily be in the same country of the customer; he/she might be located anywhere in the world. The selection of engineers depends on MS policies, such as the nature of the required task (engagement, workshop, health check, etc.). In SA, MS may cancel the engineer's visit because the engineer would not be able to visit the customer on-time because of visa procedures. Consequences for this cancellation or re-scheduling are profound for MS and the customer as well.

Besides the visa procedures, the 'government regulations' factor includes other factors such as delay in payment, Saudization of the workforce, and the criteria for winning the bid that gives the priority to the cheapest bidders. The following answers were given by top managers of public and private organizations:

"The visa issues, there are not many resources available locally, and getting them on time to deliver the results sometimes is difficult……the requirement that there have to be local people involved for example in the area of IT security, and this is not possible always".

"The quality of the winning proposal might not match the needed work due to the system rules (winner is the lowest bid)".

"Awarding criteria to public bids is not clear and hold a lot of corruption and misleading"

"When the scope involves delivery and installation, the contractual rules do not allow to release payments until the system is operational which should not be an issue under normal circumstances however sometimes the reasons [to delay the operation] are beyond the control of the contractor or customer (i.e. power, connectivity and other site readiness issues)".

"The time from setting the requirement to release of RFP to award can take up to 6 months which changes the technology and model numbers that might have been quoted and differences in prices might affect the project with the replacement models".

"Internal weak coordination between organization department (i.e. who will sign acceptance, or material delivery acceptance, or cable paths, etc…)".

"Visa regulations and process, this is maybe one of the major obstacles we face in our operation. Mainly the issue arises from government rules and regulations that prevent visa issuance and/or modification. We are simply expected to know the candidate nationality, exact education certifications or qualifications before we request hiring him which takes a very long time, not to mention that we are also required to have enough Saudization to cover the VISA's we requested for the un-hired employees before even hiring them".

To support a wide use of technology and online applications in the public and private organizations, our advice here is to make the governmental regulation in the emerging markets simpler and more flexible.

(2) *Vendors and technology suppliers*: like other Middle Eastern emerging markets, the ICT sector in SA highly depends on foreign vendors. This is because of a clear lack of local expertise to support systems development. One of the public organization managers described this as follows:

"Because […] system was down for several hours and our team failed to fix the issue, we contact with the vendor to help us. After the vendor agreed (maybe not free; this is based on the level of support), the expert by the vendor tried to fix the issue remotely but he failed! There would be a need to on-site visit. Due to traveling and flight reservation issue, we waited two days. The expert stayed additional two days to fix the issue completely. That happened although we are classified as a VIP customer!".

In the above scenario, the one week period could be reduced to a few days if the expert was in the same city of the customer. Meanwhile, this period would be extended if the expert discovered the problem was not related to the vendor's system but to another system that was integrated with the vendor's one. This indicates to the need for adoption of the IT integration solution, as a manager said:

"The lack of understanding of the integrated […] solutions, that will empower the discovery and remediation processes, on top, it will lower the cost of the operations and turnovers".

(3) *Training/knowledge transfer and documentation*: end users working on the ICT-based systems need self-realization (Sommerville, 2015). To satisfy this, we advised the top management to provide the users with training programs where people can develop their

skills with the considered system and gain new knowledge. The following is a sample of answers given by top managers:

"Training of graduates from SA universities can help in building competency locally, but this aspect is lacking or weak"

"Transfer of knowledge to the customer side is a challenge to any IT project as if not done properly would have a great risk to stop the IT project even after it's been delivered to the customer".

Documentation also affects the ICT project implementation. This includes the unavailability of real data of past failure cases (as we stated this in Section 3.4). Besides, documentation includes the unavailability of detailed documents for existing systems and services (i.e. interface specification, analysis models, design artifacts, and source code). The following answers show how the participants suffer from the documentation-related problems:

"There is no transparent way [for] organizations to find data about previous successful/failing projects for a particular IT company"

"Sometimes major issues arise due to lack of documentation from the customer side (i.e. AutoCAD drawings, cable paths, etc…)".

(4) *Others*: this includes the absence of change management, unavailability of PMO, poor follow-ups after project delivery, and recruitment criteria. Our literature revealed that the chance of failure is less with the presence of change management programs. However, many organizations in SA do not have change management programs in place (Al-Turki, 2011). Forming PMOs in the organization is expected to diminish the negative impact of other factors including poor follow-ups and recruitment issues. Again, this emphasizes the importance of PM, which has been recently considered as one of the top 10 most in-demand IT skills for 2017 (Pratt, 2017).

The above qualitative analysis contains results that seem to not have been published before including visa procedures, vendor support, and lack of documentation of the past real-world failure cases. In the next section, we will show how these factors and business culture played a main role in ICT project failures in SA.

A real-world software project failure case study

Before exploring our failure case in depth, we should note two points. First, due to the many political complexities and business models in the Middle Eastern markets, researchers cannot simply find a real-world software project to work on it as they can in developed markets (Jakobsen, 2013). This might be the main reason that no study was able to present such a case on software project failure from SA despite the high failure rate shown in the studies in Section 3.3. Second, we did not find a formal definition or solid difference between ICT project and software project. For this, we adopt our own difference and use it here. Software projects are just one type of ICT project. Of course they do not only require software to work but also other parts such as hardware and networks, but the main project involves creating new software with existing hardware and networks.

Archival data approach

We used archival data to examine a failed software project. Archival data include, for example, meeting minutes, documents from different development phases, failure data, organizational charts, financial records, and other previously collected measurements in an organization (Wohlin et al.,

2012). These types of data help us discover things that did not work or find areas of improvement by avoiding past failures. (Sommerville, 2015).

However, it is important to keep in mind that the data records or documents were not originally developed with the intention to provide data for the research (Wohlin et al., 2012). Herein, the unit of analysis is an ERP system at a governmental organization in an emerging market. Our objective is to identify and analyze the factors that lead to ICT projects failure through this real-world case. For reasons of confidentiality, the real names of the studied organizations are labelled as 'X,' 'Y,' and 'Z.'

Background

According to the Yesser program (mentioned in Section 4.3) that was launched in 2005, management and administrative systems in public organizations in SA have been replaced with enterprise systems such as ERP. The ERP is basically a system that integrates all functions and departments throughout an organization into a single IT system (or integrated set of IT systems) so that employees can make decisions by viewing enterprise-wide information on all business operations (Baltzan & Phillips, 2015). It is configured by installing various modules such as HR, finance, warehousing, and procurement.

A brief history of the problem

X is a large public organization in SA that has branches in several different cities in the country. X was required to spin off some branches and create a new public organization, Y. This decision occurred when the number of branches had increased to the point that communication between branches and headquarters became too complicated. The objectives and missions of both X and Y are clearly similar, but Y provides services to cities distant from headquarters.

This separation led to the independence of most of the administrative functions and computerized systems. However, the ERP system (Oracle at Y) remained but with no dependency on X. The contract of Z, an Oracle partner that supplied the ERP to X and Y, expired with no renewal for some reasons. Therefore, while X's support for Y's ERP continued after the separation was done, that support diminished year after year for several reasons. Later, X implemented a new ERP in 2011, choosing SAP rather than Oracle. Subsequently, when Y's personnel faced any problems with their (still Oracle) ERP system, fixing it required much time and effort because the ERP link between X and Y was now weak, if not broken. Moreover, Y is a growing organization, meaning that building a new ERP from scratch would not be feasible due to high costs. Top managers in Y justified low levels of ERP financial support by citing lack of resources (people, budget, etc.). The ERP problems that employees at Y faced were increasing daily with no real solution in sight. As a result, most of the ERP end users at Y were dissatisfied with the system, especially when certain employees discovered incorrect calculations being made on some fields and records that affected Y's personnel. Consequently, those employees had to perform the affected calculations manually. Unfortunately, the IT people at Y were qualified in most IT aspects—except ERP implementation. Top management at both X and Y communicated using official letters and emails regarding this issue with no agreement because each organization felt the other was the root cause of the problem. In that time, Z, an ERP partner, was not recommended by some experts because of its reputation. However, Y contracted with company Z to address its ERP issues. Y selected Z primarily for low cost reasons. Z considered X and Y VIP customers because of the past contract, but as a side effect of selecting a partner for low cost reasons, quality was affected, and the ERP problems were not fixed as completely as Y wanted. For its part, Z performed unprofessionally because its contract with X and Y expired; it dealt with the Y tasks voluntarily.

Y then contacted directly with Oracle to fix the problems. A four-person Oracle team visited Y and stayed for two weeks. From a set of pre-screening interviews, the team observed that the HR

module had multiple issues compared with other modules. The team performed interviews with 18 people who included managers and end users in six departments: IT, finance, warehouse, purchasing, budget and planning—accounting, and HR.

Potential challenges

As mentioned in the previous section, Y's HR module had the most issues in its ERP system. In their assessment report, the Oracle team confirmed a large number of issues in the HR module (approximately 40) compared with a smaller number of issues in the other modules. We summarize some of the major HR issues in Table 3.

Discussion

From Table 3, we can conclude that most of these problems are managerial/organizational rather than technical. Financial problems contribute to only a small portion of the problems found in Y's ERP.

The managerial and organizational problems stemmed from mismatches between the ERP and Y's business processes that cannot be flexibly implemented. Challenge # 2 in Table 3 is an example of such a mismatch, in which some ERP features cannot be automated because they need approval by a manager. However, Y's business processes require at least four levels of approval. For this reason, plus Y's lack of experience in ERP implementation, these challenges were not understood properly by Y's end users. This observation confirms the result of previous studies (Almajed & Mayhew, 2013; Saleh et al., 2013) – summarized in Section 3.3. In particular, business process reengineering (BPR) was found to be critical in the success of IT software projects in SA. According to Schniederjans and

Table 3. Some of the HR challenges in Y's ERP.

#	Problem and Impact	Solution	Needed Training
1	*Lack of position/role titles for employees in the system*. This lack means that end users enter any title for employees to avoid being late in performing their tasks. The titles entered are not consistent with the official titles adopted by the ministry. However, the system allows such incorrect entries to occur.	Entering the official position/role titles and linking them with the employees. This requires (a) removing any incorrect titles already entered, and (b) installing the correct title categories from the ministry.	Yes
2	*Unconditional changes*. When a decision is made to change an employee's status (e.g. from contract to formal employee), the system accepts the change regardless of whether the required conditions for such a change are satisfied.	The system should accept such entries only after taking into account the required approvals from the responsible personnel.	No
3	*Vacation issues*. The system does not track transactions related to vacations (e.g. extensions, cancellations, and breaks). Moreover, the calculations for specific types of absences (e.g. emergency and parturition for women) are inaccurate.	Y's IT department should activate the Self-Service module[a] for vacations. Because the Hijri calendar is the formal calendar used by governmental organizations in SA, it should be considered when the module is activated and when vacation calculations are revised and performed. Lastly, periodic vacation and statistical reports should be made available.	Yes
4	*Manual entry*. External assignments for all employee categories are entered manually. This can waste money. In addition, employees entering the assignments might assign themselves more than they are due.	Assignments should be linked to each employee's category. To accomplish this, a new link with the budget & planning module should be created.	Yes
5	Compensation calculations. The equations related to the basic salary and additional compensation (e.g. transportation, housing, etc.) calculations for non-Saudi employees did not work correctly, which led to incorrect results.	Modifications should be made to these equations. Again, the Hijri calendar should be taken into account due to differences between the Hijri and Gregorian calendars.	Yes

[a]The Self-Service module offers a range of features that an employee can use to update and maintain his/ her information. It has become an increasingly prevalent trend in HR management.

Kim (2003), BPR should always precede ERP implementation. We think this did not happen in Y's case; the system was developed without taking BPR into account as it should have been.

The technical challenges (such as Challenges #1, #3, and #5 in Table 3) highlighted several constraints encoded into the ERP architecture that are difficult to fix at the present time such as implementing the Hijri calendar and achieving compliance with ministry regulations. There was a lack of support for the reconfiguration process that would be required in two cases: (a) implementing add/delete/modify events for every module or subsystem to address the inconsistency of entered job titles with those adopted by the ministry, and (b) calculating the financial fiscal year according to the Hijri calendar, the formal calendar in SA. The requirement to adhere to government-imposed restrictions caused several technical problems for Y, which is a governmental organization.

The last column in Table 3 indicates whether the suggested modification would require training. As discussed in our literature review in Section 3, some of the existing studies found that the lack of training played a key role in several software project failures in SA (Aldayel et al., 2011; Almajed & Mayhew, 2013; Al-Turki, 2011). In the case of Y, all the people using the ERP had completed their required training on the ERP system at suitable times, delivered by Z. However, after investigating the issue, we found that the training had not been performed as it should have been. To understand how management/organization factors are the main reason behind the overall Y's ERP failure, we present the following example.

Suppose an end user, Sami, completed the training required for module A of the ERP. The training was delivered by Z and might have been performed at Y or elsewhere. Subsequently, Sami's work on module A would be expected to be fine. However, for some reasons Sami left Y, or in the best case, moved to another department within Y. Sami's former role in Y would now either be fulfilled by Ali, another end user, or left vacant, with no one fulfilling that role. In reality, there are several different scenarios that can occur in such a case. If the role remained unoccupied, two possibilities could occur: (a) Sami might continue to work on A for some time until Ali could take over the role, or (b) Sami might have left without a replacement; therefore, when end users need some help, they must contact Sami again. However, Sami's involvement is now voluntary. In some extreme cases, we have seen Y's employees remain in contact with the former expert (Sami in this example), even though Sami may no longer work for Y. In the other case, where Ali takes over Sami's role, there are also two possibilities (a) Sami does not provide Ali with the required training, so Ali, or his boss, must ask an external company to provide him with such training, or (b) Sami provides Ali with insufficient training because Sami needs to move to his new position without any delay.

Even though training is related to the end user, the above scenarios and possibilities that happened in Y indicate untargeted and poor management. For example, how can management let Sami leave/move while Ali's level of competence is not yet satisfactory? How should Ali or his boss communicate with an external company to gain the required training? Should they try to obtain the training from Z again? An issue such as this may raise many questions. As we stated earlier, the financial aspect did not have a direct effect on failure because of Saudi government subsidization for public organizations—especially those that, like Y, are still growing and have obtained hundreds of millions of dollars annually for the past few years. In Y, a great percentage of this subsidization has been spent repairing ERP, on topics ranging from consultancy to maintenance.

For us, this conclusion is expected because the business environment in SA, like that in other Middle Eastern countries, is characterized by centralization and autocratic leadership, low tolerance for ambiguity, low cooperation and appreciation of independence and good performance, the prevalence of favoritism and nepotism, and resistance to innovation and change (Abdul-Gader, 1997; Al-Turki, 2011; Baumann, 2013). A disturbing fact about SA is that poor management and business environment problems occur not only in the IT field but also in other important fields such as construction projects (Ikediashi, Ogunlana, & Alotaibi, 2014). In the near future, the negative impact of this problem is expected to diminish, especially in the public sector because Saudi organizations have recently been required to establish PMOs to raise efficiency and improve project delivery. In turn, that has implications for decreasing the high failure rates of software projects (Altahtooh & Emsley, 2013). As we stated

earlier, the initial results of forming PMOs in SA and other emerging markets indicated that this concept is still at an immature stage compared with developed countries.

Recommendations

Contracting an ERP implementation is not a simple task because there are large numbers of stakeholders. Therefore, several researchers tried to address the stakeholder issue in their studies and selected ERP systems for their case studies of IT software project failures and successes (for example, Al-Turki, 2011; Chen et al., 2009; Mo & He, 2015; Saleh et al., 2013).

Today, Y's ERP, although it still suffers from many problems, especially in the HR module, currently works in other departments for business functions such as procurement and finance. At the same time, Y is still in communication with IT companies in SA to repair ongoing problems. Additional challenges come from the fact that Y is a public organization that must communicate with larger e-government organizations. We think the above challenges and problems could have been avoided if Y had taken its ERP system into account during the physical separation from X—as it did with other functions such as budget & planning, sales, and payroll. While building a new ERP system from scratch is costly for a growing organization such as Y, at minimum, the top management in Y should have clarified the relationship with X in case problems occurred with the existing ERP implementation.

Forgetting the mistakes of the past, the above analysis and discussion, we can come up with four possible options to address Y's current ERP challenges:

(1) Y could upgrade the system,
(2) Y could continue with its current system,
(3) Y could customize its current system, and
(4) Y could select a new system.

We think the first three options are not viable. Business rule validation is always a drawback of system upgrades because hardcoded business rules must be handled with care; otherwise they will be overridden by the upgrade. The second option should also be avoided because Y's current system lacks the necessary functionality to support its present business culture requirements and future business needs, especially if we take into account that Y is going to expand (i.e. scale-up issues). A customization option would be suitable only if Y was itself in the software industry, but it is not. We believe that selecting a new ERP system (Option 4) seems to be the most viable option at this moment for Y, but only under two conditions: (a) the new system must come from a world-class vendor, and (b) maintenance and training should be negotiated as part of the contract. Although Option 4 may cost a bit more than the other options, it will save not only money but also time, effort, and resources. Another reason for Y to adopt Option 4 is that X discarded Y's current system just a few years ago and moved to a different one with another vendor. The question that Y should ask is: Why did X discard its former system? If Y still has budget problems, a national cloud-based ERP may be a good solution. With this type of ERP, the functionality is accessed by end users through a web browser and managed centrally by an ERP vendor. Costs can be much lower because while Y configures and accesses the software through its computer's Internet connection; the provider bears the burden of hosting the application, maintains all IT infrastructure, and provides service guarantees; therefore, the system is always available (i.e. running). In addition to reduced costs, more benefits can also be obtained with cloud-based ERP, as discussed in (Parthasarathy, 2013). However, to the best of our knowledge, no public organization in SA currently uses cloud-based ERP. We expect that some will use it in the near future because the cloud market is highly growing and nearly 13% of Saudi establishments have begun using cloud-based computing services since 2014 (Communications and IT Commission, 2014; Saudi Gazette, 2016).

A comparison with a developing market (Iraq)

In order to provide international perspectives, we compare and discuss the findings with relevant literature on the field. Our comparison has been made with Iraq, another Arab country in the region that whose economy is dominated by the oil sector, i.e. like SA.

ICT project failures in Iraq

Our case would be based on Amen, Nabi, and Mahmood (2016), which investigates the reasons of ICT project failure. That study was conducted on the Kurdistan Regional Government (KRG). The KRG is the ruling body of the largely Kurdish region of Northern Iraq and has assumed governmental responsibility in the federal region of Iraq. Since 2007, the IT department in KRG has implemented several projects. Figure 2 (borrowed from Amen et al., 2016) demonstrates the reasons behind the ICT project failure in Iraq. The most important reasons were: (in order) poor planning, lack of IT experts, lack of infrastructure, and budget. Besides these reasons, additional factors commented on by participants included poor communication and some political complexities.

Analysis and discussion

The outcomes showed that there were some similarities and differences between SA and Iraq. In both countries, ICT projects failure was mostly influenced by three common factors: lack of planning, poor communications, and inexperienced IT staff.

Table 4 summarizes the ranking of common factors in both markets. Clearly, planning is the first top ranking influencing factor in both markets. Lack of experienced people is the seventh top ranking factor for SA compared with the second ranking for Iraq. The third common factor, poor

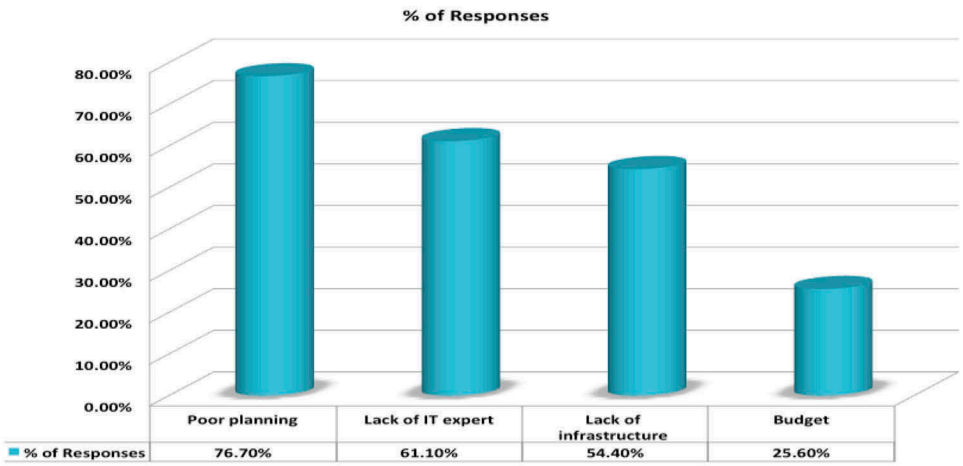

Figure 2. Reasons of ICT projects failure in KRG (Iraq).

communication, is the fourth top ranking factor compared with the fifth ranking for Iraq; this factor is not shown in Figure 2 because it was considered as an additional factor. Table 4 also shows a correlation analysis that was performed to test the relationship between the two ranks of SA (x) and Iraq (y). This analysis attempts to measure the strength of such a relationship between two variables (x and y) by means of a single number called a linear correlation coefficient (i.e. Pearson's *r*) (Walpole et al., 2011). Clearly, there is a positive correlation (24%) between the two countries.

Table 4. Summary of the common factors of ICT projects failure in SA and Iraq.

Factor	SA (x)	Iraq (y)	xy	x^2	y^2
Lack of planning	1	1	1	1	1
Poor communication	4	5	20	16	25
Inexperienced IT staff	7	2	14	49	4
Sum	12	8	35	66	30
Pearson's r			0.24		

The above result emphasizes the importance of planning in ICT project implementation. As we mentioned in our analysis of the survey results (Section 4.3), without good planning, it would be difficult to make reasonable estimates of resources, cost, and schedule. Unfortunately, this factor is not expected to be addressed in the near future not only in SA or Iraq but also in other Middle Eastern markets because still there are many political complexities in the region. In addition, the automation (e.g. tools, templates, etc.) in the planning activities is relatively little compared with the other PM activities such as execution and communication among stakeholders.

Although both countries (SA and Iraq) are located in the same region, and their economy is dominated by the oil sector, there is a difference in the ICT sector. Besides, the above common factors, the outcomes showed that failure in SA was influenced by resistance to change while it is influenced by budget and political issues in Iraq. A potential explanation for the Iraq case might come from the war situation in the entire country; a long history of Iraq has been marred several times by the ravages of war. These wars did not only cause a high level of economic depression in the country but also a lack of IT experienced staff. As the 2007 estimate suggested, there are around four million Iraqi refugees around the world, and the number definitely has risen and expects to rise more in the future as instability prevails (World Atlas)[10]. However, the two factors (budget and political issues) did not only affect ICT projects but also affect projects in other fields. In contrast, SA has not suffered from such problems for a long time but still suffers from similar problems that can lead to failure, such as government regulations and recruitment criteria (e.g. VISA procedures, see Section 5).

Summary of results

At this point, we are ready to summarize our answer to the central RQ mentioned in Section 1: *what are the major factors for ICT projects failure in the emerging markets?* Based on the above results obtained by different investigation methods, managerial and organizational factors are the major factors of ICT project failure in the emerging markets compared to other factors, such as technical and financial factors. Table 5 shows the top three factors found by each method.

Most of the factors are management and organizational factors. Only two factors are non-managerial, the system implementation and configuration such as the Hijri calendar issue (technical factor by the archival data method) and lack of infrastructure (financial factor by Iraq case). In general, we can also note that the most important factors among all research methods are 'lack of planning' and 'training' because they are shown with two methods. The former appeared through

Table 5. Summary of the answering to the RQ. Asterisk means the factor appears more than once.

#	Method	Top ranking factors	Classification
1	Questionnaire-based survey	Lack of planning*, resistance to change, misunderstanding user requirements	Management/ organization
2	Qualitative analysis	Government regulations, vendor support, training* & documentation	Management/ organization
3	Archival data	Poor BPR, system implementation & configuration, training*	Management/ organization & technical
4	Comparison with another market	Lack of planning*, inexperienced IT staff, lack of infrastructure	Management/ organization & financial

questionnaire-based survey and comparison with Iraq while the latter appeared through the qualitative analysis and archival data methods.

Limitations

Our target was to cover the most important factors that lead to ICT project failure in emerging markets. The size and scope of coverage of our study combined with an extensive literature review (Section 3), questionnaire-based survey (Section 4), qualitative analysis (Section 5), and archival documents of a real-world ICT project (Section 6) give strong validity to our findings. However, our analysis provides a number of limitations that suggest that further research on this area would be valuable. In this section, we describe four threads to the study's validity: internal, construct, external, and reliability validity (Wohlin et al., 2012).

Internal validity: the extent to which measured variables cause observable effects in the experimental data. Here, this is not a concern because we make no causal references as a result.

Construct validity: the appropriateness/accuracy of the measures and metrics used for the concepts studied. Construct validity may come from our description for the participants' answers qualitatively; this information was written by different people working in different firms. In addition, it is hard to assess the quality of archival data that were not developed with the intention to provide them for research;

External validity: the ability to generalize findings and results to other domains. The results may be generalized to other Middle Eastern emerging markets that have economic and cultural bases similar to SA, such as GCC countries.

Reliability: the ability of other researchers to repeat a case study and observe similar results. To reinforce the reliability and reduce the potential for researcher bias, we carefully documented our procedures while conducting our case study; our research setting was described in detail. Source triangulation was also used to mitigate the negative impact of an interpretation of a single data source.

Conclusion and future work

A number of studies have been conducted to address the high rate of ICT projects failure in emerging markets. However, still, failure occurs, despite government subsidization for this sector in these countries. This paper discusses and debates the factors for ICT project failures in emerging markets using a representative sample of organizations in Saudi Arabia (SA) and provides some directions for future research. There is a need to identify failure factors for implementing ICT projects in emerging markets and to show a real-world case of failure in such countries. This exploratory study has tried to fill the first gap by carrying out a wide survey conducted with local and multinational firms working in SA including a qualitative analysis for commenting of the participants' answers. With respect to the second point, we conducted a case study of a challenged ERP project from a public sector. We have also made a comparison with Iraq, a Middle Eastern market. Our results indicate that most of the problems in emerging markets stem from management/organization factors, such as lack of planning, training, and government regulations. With good planning, other management/organization factors (e.g. resistance to change, misunderstanding user requirements, vendor support, poor BPR, lack of documentation, and inexperienced IT staff) can be minimized. To perform good planning, our recommendation herein is to form a PMO in every organization. Technical and financial factors (e.g. system configuration for the Hijri calendar and lack of infrastructure, respectively) have low influence because of the strong financial capabilities in total in emerging markets. This paper is important for IT project managers, software engineers, end users, and software vendors.

As we stated in the paper, many issues remain open for further study. The resulting factors in this study should be validated using data from additional industrial projects. More research is also required to use the cloud-based enterprise systems in organizations in the emerging markets owing to cost.

Notes

1. www.standishgroup.com.
2. A number of practitioners and researchers have generally presented some limitations on the Standish Group's Chaos reports, as described in (Eveleens & Verhoef, 2010; Glass, 2005; Jorgensen & Molokken-Ostvold, 2006).
3. https://cs.calvin.edu/courses/cs/262/kvlinden/resources/CHAOSManifesto2012.pdf.
4. https://www.msci.com/market-cap-weighted-indexes.
5. The previous URL.
6. BMI (Business Monitor International) website is http://www.bmiresearch.com/.
7. Structures that become manifest in the interdependencies between entities and resources can be described as ecosystems. Some of the entities may be persons, such as stakeholders, whereas the resources can originate in the business requirements or the culture of the organization (Alami, 2016).
8. A PMO is a group/department within an enterprise that defines and maintains standards for PMs within the organization (Altahtooh & Emsley, 2013).
9. Yesser program is an umbrella for all Saudi e-government activities, procedures, legislations and other related issues and acts as the government's controller. The program has been launched and regulated in cooperation with three entities, the Ministry of Communication and IT, the Ministry of Finance and Communication, and the IT Commission. The official site is (http://www.yesser.gov.sa/en).
10. World Atlas. The world's most war-torn countries. Retreived November 1, 2017, from http://www.worldatlas.com/articles/the-world-s-most-war-torn-countries.html

References

Abdul-Gader, A. H. (1997). Information system strategies for multinational companies in Arab Gulf countries. *International Journal of Information Management*, *17*(1), 3–12. doi:10.1016/S0268-4012(96)00038-2

Abouzahra, M. (2011, November 4–6). *Causes of failure in healthcare IS/IT projects*. The 3rd International Conference on Advanced Management Science, Kuala Lumpur, Malaysia

Abu-Shanab, E., & Al-Saggar, A. (2013). Reasons behind IT project failure: The case of Jordan. In S. Saeed, M. A. Khan, & R. Ahmad (Eds.), *Business strategies and approaches for effective engineering management* (pp. 188–2002). USA: Business Science Reference - IGI Global.

Afzal, M. H. (2014). Large scale IT projects: Study and analysis of failures and winning factors. *IETE Technical Report*, *31*(3), 214–219. doi:10.1080/02564602.2014.906862

Al Sharief, R. Y. (2012). Key challenges of e-government adoption in less developed countries: The case of Saudi Arabia. *Proceedings of the International Journal of Customer Relationship Marketing and Management (IJCRMM)*, *3* (4), 31–39. doi:10.4018/IJCRMM

Al-Ahmad, W., Al-Fagih, K., Khanfar, K., Alsamara, K., Abuleil, S., & Abu-Salem, H. (2009). A taxonomy of an IT project failure: Root causes. *International Management Review*, *5*(1), 93–104.

Alami, A. (2016). Why do information technology projects fail? *Procedia Computer Science*, *100*, 62–71. doi:10.1016/j.procs.2016.09.124

Alateyah, S. A., Crowder, R. M., & Wills, G. B. (2013). Identified factors affecting the citizen's intention to adopt e-government in Saudi Arabia. *World Academy of Science, Engineering and Technology*, *80*, 904–912.

Aldayel, A., Aldayel, M., & Al-Mudimigh, A. (2011). The critical success factors of ERP implementation in higher education in Saudi Arabia: A case study. *Journal of Information Technology & Economic Development*, *2*(2), 1–16.

Alfaadel, F., Alawairdhi, M., & Al-Zyoud, M. (2012, April 18–20). *Success and failure of IT projects: A study in Saudi Arabia*. Proceedings of the 11th WSEAS international conference on Applied Computer and Applied Computational Science (pp. 77–82), Rovaniemi, Finland.

Alfarraj, O., Alhussain, T., & Abugabah, A. (2013). Identifying the factors influencing the development of eGovernment in Saudi Arabia: The employment of grounded theory techniques. *International Journal of Information and Education Technology*, *3*(3), 319–324. doi:10.7763/IJIET.2013.V3.289

Almajed, A. I., & Mayhew, P. (2013). Chief information officers' perceptions of IT project success factors in Saudi Arabian public organizations: An exploratory study. *IADIS International Journal on Computer Science and Information Systems*, *8*(1), 66–78.

Almajed, A. I., & Mayhew, P. (2014, August 27–29). *An empirical investigation of IT project success in developing countries*. Science and Information Conference, London, UK.

Altahtooh, U. A., & Emsley, M. W. (2013). An empirical study into the use of a project management office in IT projects in Saudi Arabia. *Issues in Information Systems*, *14*(1), 366–375.

Altahtooh, U. A., & Emsley, M. W. (2015). IT projects: Classifying risk factors and identifying project outcomes. *Journal of Industrial and Intelligent Information*, *3*(3), 246–252.

Al-Turki, U. M. (2011). An exploratory study of ERP implementation in Saudi Arabia. *Production Planning & Control*, *22*(4), 403–413. doi:10.1080/09537287.2010.491490

Amen, B. M., Nabi, R. M., & Mahmood, S. M. (2016). An investigation in IT projects failure within Kurdistan Regional Government of Iraq. *International Journal of Computer Applications*, *133*(2), 0975–8887.

Bailey, J. (2007, February 19). JetBlue's CEO is mortified after fliers are stranded. *New York Times newspaper*. Retrieved November 1, 2017, from http://www.nytimes.com/2007/02/19/business/19jetblue.html?pagewanted=all&_r=0

Baltzan, P., & Phillips, A. (2015). *Essentials of business driven information systems* (5th ed.). New York, USA: McGraw-Hill Education.

Baumann, L. (2013). *The impact of national culture on project management in the Middle East* (Dissertation). Loughborough University, UK.

BMI Research. (2016). *Saudi Arabia information technology report (Q2 2016)*. London, UK: Business Monitor International Ltd.

Bouras, A., & Bendak, S. (2014). Managing IT projects in public companies: A case study. *Journal of Engineering Project, and Production Management*, *4*(2), 74–80.

Chatfield, A. T., & Alhujran, O. (2009). A cross-country comparative analysis of e-government service delivery among Arab countries. *Information Technology for Development*, *15*(3), 151–170. doi:10.1002/itdj.20124

Chen, C. C., Law, C. C. H., & Yang, S. C. (2009). Managing ERP implementation failure: A project management perspective. *IEEE Transactions on Engineering Management*, *56*(1), 157–170. doi:10.1109/TEM.2008.2009802

CIO Staff. (2007, April 2). When bad things happen to good projects. *CIO Magazine*. Retrieved November 1, 2017, from http://www.cio.com/article/2439385/project-management/when-bad-things-happen-to-good-projects.html

Coakes, E., Amar, A. D., & Granados, M. L. (2013, June 27–29). *Success or failure in knowledge management systems: A universal issue*. International Working Conference on Transfer and Diffusion of IT (pp. 39–56), Bangalore, India.

Communications and IT Commission. (2014). *Establishment report (corporate, government and education) ICT survey results*. Retrieved November 1, 2017, from http://www.citc.gov.sa/English/Reportsandstudies/Studies/Documents/IT021E-PublicReportForEstab.pdf

Dieste, O., Juristo, N., & Martínez, M. D. (2013). *Software industry experiments: A systematic literature review*. Proceedings of the 1st International Workshop Conducting Empirical Studies in Industry (pp. 2–8), San Francisco, CA.

Doraiswamy, P., & Shiv, P. (2012). *50 Top IT Project Management Challenges*. Ely, Cambridgeshire, UK: IT Governance Publishing.

Dwivedi, Y. K., Wastell, D. G., Laumer, S., Henriksen, H. Z., Myers, M. D., Bunker, D., … Srivastava, S. C. (2015). Research on information systems failures and successes: Status update and future directions. *Information Systems Frontiers*, *17*(1), 143–157. doi:10.1007/s10796-014-9500-y

Ebad, S. (2016). Influencing factors for IT software project failures in developing countries— A critical literature survey. *Journal of Software*, *11*(11), 1145–1153. doi:10.17706/jsw.11.11.1145-1153

El Emam, K., & Koru, A. G. (2008). A replicated survey of IT software project failures. *IEEE Software*, *25*(5), 84–90. doi:10.1109/MS.2008.107

Eveleens, J., & Verhoef, C. (2010). The rise and fall of the chaos report figures. *IEEE Software*, *27*(1), 30. doi:10.1109/MS.2009.154

Fink, A. (2003). *The survey handbook* (2nd ed.). Thousand Oaks/London: SAGE.

Glass, R. L. (1999). Evolving a new theory of project success. *Communications of ACM Magazine*, *42*(11), 17–19.

Glass, R. L. (2005). IT failure rates—70 percent or 10–15 percent? *IEEE Software*, *22*(3), 110–112. doi:10.1109/MS.2005.66

Hirsch, J. (2014, February 12). Toyota recalls 1.9 million Prius hybrids to fix software problem. *Los Angeles Times newspaper*. Retrieved November 1, 2017, from http://articles.latimes.com/2014/feb/12/autos/la-fi-hy-toyota-prius-recall-20140212

Ikediashi, D. I., Ogunlana, S. O., & Alotaibi, A. (2014). Analysis of project failure factors for infrastructure projects in Saudi Arabia: A multivariate approach. *Journal of Construction in Developing Countries*, *19*(1), 35–52.

Jakobsen, S. (2013, August 24). MENA and Egypt are like an upside down Europe. *Arab News*. Retreived November 1, 2017, from http://www.arabnews.com/news/462245

Jorgensen, M., & Molokken-Ostvold, K. (2006). How large are software cost overruns? critical comments on the Standish Group's Chaos reports. *Information and Software Technology*, *48*(4), 297–301.

Lehtinen, T., Mäntylä, M., Vanhanen, J., & Itkonen, J. (2014). Perceived causes of software project failures – An analysis of their relationships. *Information and Software Technology*, *56*(6), 623–643. doi:10.1016/j.infsof.2014.01.015

Lemon, W. F., Liebowitz, J., Burn, J., & Hackney, R. (2002). Information systems project failure: A comparative study of two countries. *Journal of Global Information Management*, *10*(2), 28–39. doi:10.4018/JGIM

Maidin, S. S., & Arshad, N. H. (2010, August 1–3). IT governance practices model in IT project approval and implementation in Malaysian public sector. Proceedings of the International Conference on Electronics and Information Engineering (ICEIE 2010) (pp. 532–536), Kyoto, Japan.

McQuaid, P. A. (2012). Software disasters—Understanding the past, to improve the future. *Journal of Software: Evolution and Process*, *24*(5), 459–470.

Meredith J.R., Mantel S. J. (2012). *Project management: A managerial approach* (8th ed.). USA: John Wiley & Sons, Inc.

Mieritz, L. (2012). *Gartner survey shows why projects fail*. Retreived November 1, 2017, from https://thisiswhatgooddlookslike.com/2012/06/10/gartner-survey-shows-why-projects-fail/

Mo, J., & He, W. (2015). The organizational change dilemma of ERP implementation in a small manufacturing company. *Journal of Business Case Studies*, *11*(3), 95–103. doi:10.19030/jbcs.v11i3.9273

MSCI Inc. (2014, June). *MSCI market classification framework*. Retreived November 1, 2017, from https://www.msci.com/documents/1296102/1330218/MSCI_Market_Classification_Framework.pdf/d93e536f-cee1-4e12-9b69-ec3886ab8cc8.

Nwakanma, C. I., Asiegbu, B. C., Ogbonna, C. A., & Njoku, P. P. C. (2013). Factors affecting successful implementation of information technology projects: Experts' perception. *European Scientific Journal*, *9*(27), 128–137.

Parthasarathy, S. (2013). Potential concerns and common benefits of cloud-based enterprise resource planning (ERP). In Z. Mahmood (Eds.), *Cloud computing*. London, UK: Springer.

Pratt, M. (2017). 10 hottest tech skills for 2017, ComputerWorld magazine. *IDG Communications*. Retrieved November 1, 2017, from http://www.computerworld.com/article/3147427/it-skills-training/10-hottest-tech-skills-for-2017.html

Rasooldeen, M. (2016, May 20). Technology will play a key role in Vision 2030. *Arab News*. Retrieved November 1, 2017, from http://www.arabnews.com/node/926986/saudi-arabia.

Remenyi, D. (1999). *Stop IT project failures through risk management*. UK: Routledge.

Saleh, M. F., Abbad, M., & Al-Shehri, M. (2013). ERP implementation success factors in Saudi Arabia. *International Journal of Computer Science and Security*, *7*(1), 15–30.

Saudi Gazette (2015). Kingdom's ICT sector spending to exceed SR138 billion by 2017. Issue: 10 September, 2015. Retrieved November 1, 2017, from http://saudigazette.com.sa/business/kingdoms-ict-sector-spending-to-exceed-sr138-billion-by-2017

Saudi Gazette. (2016, February). Saudi cloud computing market to surge 44.5%. Issue: 2. Retrieved November 1, 2017, from http://saudigazette.com.sa/business/saudi-cloud-computing-market-to-surge-44-5

Schniederjans, M. J., & Kim, G. C. (2003). Implementing enterprise resource planning systems with total quality control and business process re-engineering: Survey results. *International Journal of Operations and Production Management*, *23*(3/4), 418–430. doi:10.1108/01443570310467339

Sommerville, I. (2015). *Software engineering* (10th ed.). Pearson.

United Nations. (2014). *E-government survey 2014*. New York, USA. Retrieved November 1, 2017, from https://publicadministration.un.org/egovkb/portals/egovkb/documents/un/2014-survey/e-gov_complete_survey-2014.pdf

Wailgum, T. (2005, May 1). University ERP: Big mess on campus. *CIO Magazine*. Retreived November 1, 2017, from http://www.cio.com/article/2439102/enterprise-resource-planning/university-erp–big-mess-on-campus.html

Walpole, R., Myers, R., Myer, S., & Ye, K. (2011). *Probability and statistics for engineers and scientists* (9th ed.). USA: Pearson.

Wang, E. T. G., Shih, S. P., Jiang, J., & Klein, G. (2008). The consistency among facilitating factors and ERP implementation success: A holistic view of fit. *Journal of Systems and Software*, *81*(9), 1609–1621. doi:10.1016/j.jss.2007.11.722

Wohlin, C., Runeson, P., Host, M., Ohlsson, M. C., Regnell, B., & Wesslen, A. (2012). *Experimentation in software engineering: An introduction*. Berlin Heidelberg, Germany: Springer-Verlag.

Xia, L. X. X., Yu, W. F., Lim, R., & Hock, L. E. (2010, July 15–17). A methodology for successful implementation of ERP in smaller companies. Proceedings of the Service Operations and Logistics and Informatics (SOLI) (pp. 380–385), QingDao, China.