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Impact of ERP systems usage on organizational agility: An empirical investigation in the banking sector

Faisal Aburub

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Faisal Aburub
MIS Department, University of Petra, Amman, Jordan

Abstract

Purpose – Enterprise resource planning (ERP) systems can be considered as cornerstone that allows most organizations to achieve their business goals. The purpose of this paper is to investigate the impact of ERP system usage on agility in organizations.

Design/methodology/approach – The data were collected from 90 branches of well-known banks in the Middle East, such as HSBC, Standard Chartered and Arab Bank. Data were analyzed using a path analysis methodology.

Findings – A new model has been developed. An empirical investigation was performed on the banking sector in the Middle East to test the new model. Despite the results showing that the impact of ERP system usage on banks' agility is significant, the variance of banks' agility that is explained by the use of ERP systems is weak. This indicates that ERP usage may not influence sufficiently the current agility drivers in Middle-Eastern banks and that there may be other significant variables that contribute to agility in the banking sector.

Research limitations/implications – The findings of this research were based on a survey conducted among banks in the Middle East. The results are applicable in Middle-Eastern banks, but may not be applicable in other regions.

Practical implications – Banking practitioners in the Middle East should be aware that successful implementation of ERP systems may not lead to the achievement of sufficient competency, flexibility, quickness, and responsiveness. Hence, such implementation may not deliver banking agility.

Originality/value – This research model investigates the impact of ERP usage on the agility of banks in the Middle East.

Keywords Empirical study, Business models, Enterprise resource planning (ERP) (packaged systems), Information system effectiveness

Paper type Research paper

1. Introduction

Organizations are facing many challenges because of various factors such as globalization, customers' high expectations and demands, outsourcing, etc. (Ramesh and Devadasan, 2005). Those challenges may lead to uncertainty and unpredictability for organizations in all sectors. In order to meet such challenges, organizations need to act quickly according to the surrounding competitive situation. Moreover, organizations need to adapt to unexpected changes in order to achieve and maintain a competitive advantage. According to Dahmardeh and Banihashemi (2010), the idea of adapting to unforeseen changes is referred to as the concept of agility. Agility can be defined as the ability of an organization to adapt to unexpected and uncertain situations and changes in the environment (Backhouse and Burns, 1999). Many researchers consider agility as a crucial factor for organizations to survive in uncertain

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and turbulent markets. An agile organization is able to react quickly to markets that change as a result of a dynamic environment. For example, the agility of an organization could affect that organization's capabilities in terms of producing and delivering new products, decreasing costs, increasing customers' satisfaction, removing non-value-added activities, and increasing competitiveness.

Many approaches and frameworks have been developed for achieving agility, such as the diagnostic framework developed by Worley and Lawler (2010), methods investigated by Dahmardeh and Banihashemi (2010), and the approach formulated by Vinodh *et al.* (2010). Moreover, researchers have proposed that the use of information technologies (ITs) could facilitate and enhance agility in organizations. According to Adrian *et al.* (2002), ITs /information systems (ISs) can be utilized in agility to improve business operations. They added that ITs/ISs could be considered as enablers and facilitators of organizational agility. Seethamraju and Sundar (2013) stated that IT can enable agility by improving decision making, facilitating communication, delivering electronic integration, and providing digital options. Adrian *et al.* (2002) classified the impact of IT on agility in organizations into three categories: speeding up activities; providing intelligent and autonomous decision-making processes; and enabling the organization to distribute operations through collaboration. Moreover, Adrian *et al.* (2002) argued that ISs are fundamental elements in developing agility. They also indicated that the effective use of IT may improve the collaboration between trading partners in ways that can increase agility in organizations.

Today, many organizations invest in large integrated ISs. Many enterprise resource planning (ERP) systems can be considered as a cornerstone that enables most organizations to achieve their business goals. According to Teittinen *et al.* (2013): "Widespread use of enterprise resource planning (ERP) systems has fundamentally reshaped the way business data are collected, stored, disseminated and used throughout the world." Moreover, Seethamraju and Sundar (2013) indicated that most firms use ERP systems and consider them a backbone to managing business processes. IT manufacturers help organizations to achieve agility by introducing various ISs, particularly ERP systems. Few studies have investigated the impact of ERP systems on agility in organizations. According to Seethamraju and Sundar (2013), ERP systems' capacity to deliver the required capability that achieves agility in organizations has not been empirically studied. Moreover, most of the studies have investigate agility as a strongly manufacturing-biased concept, but have not investigated the concept in relation to the banking sector. Therefore, this research aims to investigate the impact of ERP systems usage on agility in organizations. To this end, an empirical investigation was performed on the banking sector in the Middle East.

2. Literature review

In 1991, the Iacocca Institute Report introduced the term "agility," which it defined as the ability to thrive in rapidly changing, fragmented markets (Jackson and Johanson, 2003). Ganguly *et al.* (2009) defined agility as the state or quality of being able to move quickly and in an easy fashion. Agility focusses on the ability of organizations to cope with unexpected changes in order to survive in an unpredictable environment, and to take advantage of changes as opportunities (Zhang and Sharifi, 2000). According to Börjesson and Mathiassen (2005), agility can be used to help the company Ericsson respond more effectively to events in the software process improvement environment. Agility is complex, and has been investigated in many disciplines.

For example, Vázquez-Bustelo *et al.* (2007) defined manufacturing agility as the capability of an organization to meet changing market requirements, maximize customer service levels, and minimize the cost of goods.

Many frameworks and methods have been developed to describe and study agility in organizations. Zhang and Sharifi (1999, 2000) developed a methodology to help manufacturing companies to achieve agility. This methodology consists of three stages: the determination of a company's agility needs and its current agility level; the determination of agility capabilities required for the company to become agile; and the identification of business practices and tools. According to Lin *et al.* (2006), stage two (agility capabilities) is the most important stage for coping with uncertainty and changes in the business environment. The capabilities of an agile organization can be defined as the means that the organization needs to have in order to make appropriate responses to changes and uncertainties that occur in the business environment. The capabilities can be categorized as follows:

2.1 Competency

"The extensive set of abilities that provide productivity, efficiency, and effectiveness of activities towards the aims and goals of the company" (Zhang and Sharifi, 1999). This can be achieved by applying an organization's strategic vision, using appropriate technology (either hardware or software), producing quality products or services, changing management, making cost effective, increasing the rate at which new products are introduced, having multi-venturing capabilities, developing business practices that are difficult to copy, increasing operational efficiency and effectiveness, cooperating across functional boundaries, and/or integration. Breu *et al.* (2002) stated that competency consists of the speed of developing new skills and competencies, the speed of acquiring the skills necessary for business process change, the speed of innovating management skills, and the speed of acquiring new IT and software skills. Therefore, competency concerns how the organization's aims and goals can be reached efficiently and effectively.

2.2 Flexibility

"The ability to process different products and achieve different objectives with the same facilities" (Zhang and Sharifi, 1999). Flexibility consists of product volume flexibility, product model/configuration flexibility, organization and organizational issues flexibility, and people flexibility. Sherehiy *et al.* (2007) identified flexibility as the ability to pursue different business strategies and tactics, and to quickly change from one strategy/task/job to another. Reed and Blunsdon (1998) described organizational flexibility as an organization's capacity to adjust its internal structures and processes in response to changes in the environment. Therefore, flexibility could be considered as the main factor of the agility of an organization that allows it to deal successfully with changes.

2.3 Quickness

"The ability to carry out tasks and operations in the shortest possible time" (Zhang and Sharifi, 1999). Quickness includes items such as the speed in bringing new products to market, quickness and timeliness of product and service delivery, and fast operations time. According to Sherehiy *et al.* (2007), the most important factor for agility in organizations is the speed of developing new skills and the speed of acquiring the skills needed for business process change. Speed may also include learning, carrying out tasks and operations, and making changes in the shortest possible time.

In addition, speed focusses on time of operations, time of production changes, time of product/service delivery, time of learning and time of adaptation to change. Therefore, speed can be defined as the ability to achieve the complete requirements of the organization to be agile in the shortest possible time.

2.4 Responsiveness

"The ability to identify changes and respond fast to them, reactively or proactively, and recover from them" (Zhang and Sharifi, 1999). According to Dyer and Shafer (2003), proactive behavior consists of two aspects: initiative and improvization. Proactive initiative means actively searching for opportunities to contribute to organizational success and taking the lead in pursuing those opportunities that appear promising. Proactive improvization requires devising and implementing new and creative approaches to pursuing opportunities and dealing with threats. Moreover, responsiveness emphasizes a time component and the ability to recover from change. Raschke (2010) identified responsiveness as "the ability to react purposefully and within an appropriate timescale to significant events, opportunities, or threats to bring about or maintain competitive advantage." Hence, organizations need to rapidly reconfigure, modify and change the way they work in order to respond to either internal or external changes in the business environment. This dimension focusses on how an organization can quickly sense and detect changes in the environment, and its ability to respond to those changes. It also concentrates on immediate reactions to changes in terms of how they are implemented in the system. For example, organizations need to respond immediately to changing customer needs as well as changing market conditions.

Daniel Vá zquez-Bustelo and Avella (2006) proposed a conceptual model for assisting the implementation of agile manufacturing. This model describes the relations between the business environment, the agile manufacturing system, manufacturing strengths, and the firm's performance. Vázquez-Bustelo *et al.* (2007) proposed a new conceptual model for achieving agility. It defines three elements: agility drivers (business environment characteristics), agility enablers (agile manufacturing practices), and outcomes. Gunasekaran (1999) suggested a framework for the development of agile manufacturing systems along with four key dimensions, namely strategies, technologies, systems, and people. Ramasesh *et al.* (2001) developed an agility model that consists of three levels: elemental, referring to the agility of an individual resource (e.g. person, machine); micro, referring to the collective agility of a firm; and macro, referring to inter-organizational agility. Lin *et al.* (2006) proposed a conceptual model for agile enterprises and a framework to measure enterprise agility. Ramasesh *et al.* (2001) suggested a conceptual framework for the modeling and simulation of the agility of a manufacturing system. In addition, Hooper *et al.* (2001), Jin-Hai *et al.* (2003), Sharp *et al.* (1999), and Daniel Vá zquez-Bustelo and Avella (2006) developed frameworks and methodologies for achieving agility.

ISs and IT have emerged to assist organizations to achieve their goals. Many researchers have considered ITs/ISs to be important components of organizational development. For example, Adrian *et al.* (2002) stated that ITs/ISs can be used for collaboration in areas such as new manufacturing/services, strategic information and knowledge management, enterprise integration and management, virtual enterprise, virtual manufacturing/services, concurrent engineering, and rapid prototyping. ERP systems currently represent an important technological infrastructure in organizations. According to Teittinen *et al.* (2013), "ERP systems are embedded by

the promise of integration that standardizes operations and thereby enables their centralized management." Such systems aim to solve management problems and mold the organization into the desired form in order to achieve a high level of performance. Hyvönen *et al.* (2006) considered ERP systems to be standard software for organizations. ERP systems can offer standard solutions for all organizations, all production sites and all tasks. Dechow and Mouritsen (2005) stated that information generated by ERP systems may be accurate, sharable, and available to many different parties. According to Teittinen *et al.* (2013), "Enterprise resource planning systems are a key IT resource today in most firms." ERP systems could allow users to make better decisions because of the improved access to and visibility of information and processes across the enterprise. Ketokivi (2006) indicated that ERP software is commercially available to any organization, and also that ERP systems can be configured and customized to meet the needs of the organization. Implementation of ERP systems within organizations can create dramatic improvements, but it can also create difficulties in other organizations (Al-Mashari and Al-Mudimigh, 2003).

Many studies have indicated that ERP systems can be used to achieve agility in organizations. For example, Ketokivi (2006) stated that ERP systems, customer relationship management, and supply chain management systems help firms to build and deliver this critical capability, i.e. agility. According to Tallon (2008), ERP systems can have a positive effect on process agility, but centralization of controls and the consequent requirements of new skills to manage improved and new processes could potentially limit agility. The impact of using ERP systems on agility in organizations is different from one organization to another. One reason for this is the volatility of the external environment.

The seminal work of Zain *et al.* (2005) launched a strong call for researchers to empirically investigate the relationships between external variables, IT acceptance, and organizational agility. In addition, there is as yet a paucity of models and frameworks that explain and predict the implications of the use of enterprise applications systems for organizations. Therefore, this research represents an attempt to further extend the arguments of Zain *et al.* (2005) and to show the applicability of these arguments in organizations that utilize enterprise applications systems.

According to Nazir and Pinsonneault (2012), the objective of process agility and innovation as imagined by ERP systems manufacturers has not been realized. There have been limited empirical studies relating to the use of ERP systems and agility in organizations within the banking sector, and this research aims to study the impact of such usage on agility in organizations in the banking sector in the Middle East. This will raise the following research question:

RQ1. What is the impact of using ERP systems on agility in Middle-Eastern banks?

Based on this, further questions can be derived, including those relating to the impact of using ERP systems on competency, flexibility, quickness, and responsiveness, as part of Middle-Eastern banks' agility.

Banking sector is one of the key pillars supporting most countries of the Middle-East economies. For example, the Jordanian banking sector contributed alongside the insurance sector, to around 11.6 percent of GDP at constant prices in 2011 (Khammash, 2012). According to Al-jazzazi and Sultan (2014), most banks in the Middle East are classified into two major banking systems; namely conventional and Islamic banking systems. Conventional banks were established previous to Islamic banks. Conventional banks are guided by capitalist principles of the western world. In 2009,

Islamic banks were operating in more than 50 countries (Hanif, 2010). Although conventional and Islamic banks operate in the same market, their profits, assets, and growth vary significantly.

In the next section we present our research model and its associated hypotheses, followed by a description of our survey and results of the empirical analysis. The final section presents insights gained from this study and extensions for future research.

3. Research model

3.1 Main study variables

Customers expect high-quality products and services, while banks are affected by changes in the environment such as slow economy, new regulations, competition, socio-cultural, technology, and policy (Channon, 1986; Harrison, 2000; Rodriguez, 2012; Pierre and Russo, 2013; Al-jazzazi and Sultan, 2014). Banks therefore need to cope with unexpected challenges and take advantage of changes to create opportunities in order to be able to meet their own goals and customers' expectations. Specifically, banks need to be agile. One of the key ways of responding to environmental changes and creating opportunities is by employing IT. Building on the literature, ERP systems can contribute to enhanced competency, quickness, flexibility, and responsiveness. This research aims to measure the contribution of ERP system use in enhancing these elements for banks in the Middle East.

In this study, a research model is presented and examined empirically in the context of the Middle East's banking sector. Figure 1 shows the model, which includes five constructs, namely use of ERP systems, responsiveness, competency, quickness, and flexibility. The model shows that the use of ERP systems may lead to banks achieving agility.

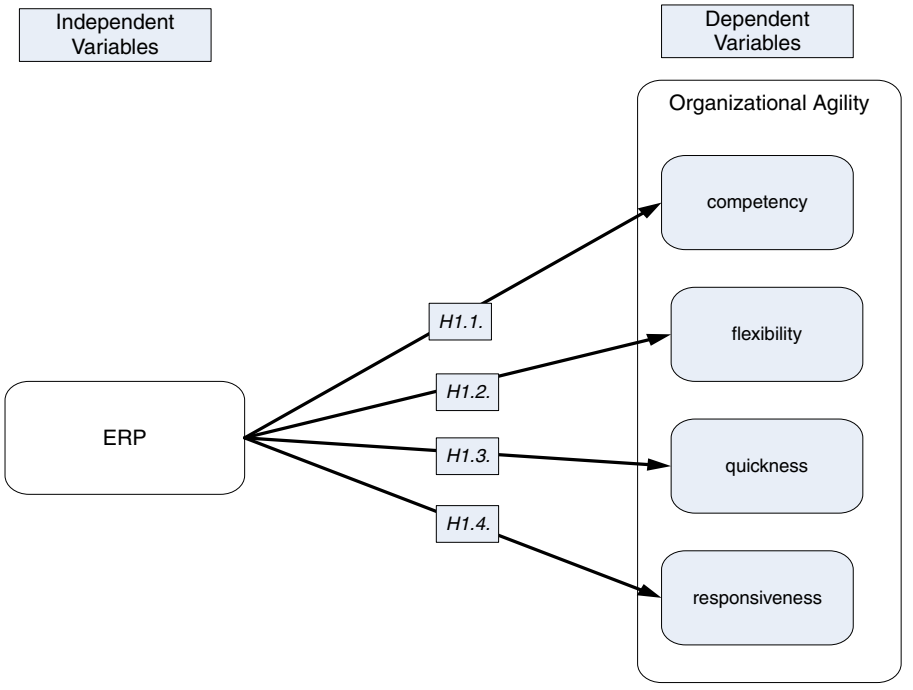

Figure 1.
Research model

It also indicates that one of the important strategic objectives of the use of ERP systems is for a bank to achieve agility. Therefore, the following hypothesis can be asserted:

H1. The use of ERP systems will have a significant and positive effect on a bank's agility.

Further hypotheses can be derived from this, as follows:

H1.1. The use of ERP systems will have a significant and positive effect on a bank's competency.

H1.2. The use of ERP systems will have a significant and positive effect on a bank's flexibility.

H1.3. The use of ERP systems will have a significant and positive effect on a bank's quickness.

H1.4. The use of ERP systems will have a significant and positive effect on a bank's responsiveness.

4. Research methods

4.1 Data sources

The data were collected through a self-administered survey from 90 branches of well-known banks in the Middle East, such as HSBC, Standard Chartered, National Bank of Abu Dhabi, National Bank of Kuwait, and Arab Bank. The questionnaire was face validated by five experts in the field, targeted managers and IT managers in the banks. We believe that those managers have deep and wide knowledge about both ERP systems and bank agility. In order to collect valid and precise data, two questionnaires were sent to each bank branch, one for bank branch manager and another questionnaire for IT manager of that bank branch. We used the answers of IT managers of banks branches to double-check answers of managers of banks branches (IT manager's answers were not part of the final analysis). When the questionnaires were collected, we compared between the answers of bank branch manager and that of IT manager for each bank branch. If there was significant differences between answers of bank branch manager and IT manager of that bank branch, then both questionnaires were ignored otherwise the answers of IT manager were only ignored. We distributed 210 questionnaires to different banks in the Middle East; 98 questionnaires were returned and four of them were excluded, a response rate of 47 percent. The characteristics of the surveyed sample are reported in Tables I and II.

4.2 Measurements development

The research constructs and item-based measurements were developed based on an intensive literature survey. Measures tested in prior studies were adopted, with changes made in order to suit the banking context. Several approaches and methods have been developed to measure ERP systems use in the banking sector.

The measures for ERP systems use were adopted from Zain *et al.* (2005). They include three items to measure how long the respondents had been using ERP systems in the banks. Appendix 1 shows the items used to measure the ERP systems use variable. The measures of agility were developed based on Zhang and Sharifi (2000). Measures of agility include four factors – responsiveness, competency, quickness, and flexibility – and nine, six, four, and 16 items, respectively, were used to measure the agility factor. Appendix 2 shows the items used to measure the four agility variables.

5. Data analysis and hypotheses testing

5.1 Reliability

Cronbach's α was used to measure the internal consistency of the research constructs. The lowest recommended acceptable value of α should be $\geqslant 0.70$ for this type of study. The Cronbach's α of most items included in this study ranged between 0.70 and 0.86, which indicated good reliabilities for the scales of Hair *et al.* (2006), as shown in Tables III and IV. The results indicate that the reliability condition was met.

Measures	Frequency	%
Gender		
Male	67	71.3
Female	27	28.7
Education		
BCs	82	87.2
Diploma	7	7.4
MA	5	5.3
PhD	0	0

Table I. Descriptive analysis of gender and education level

Measures	Mean	SD
Age	32.3	7.94
Experience	8.9	7.34

Table II. Descriptive analysis of age and experience

KMO and Bartlett's test		Reliability analysis
Kaiser-Meyer-Olkin measure of sampling adequacy		0.911
Bartlett's test of sphericity	Approx. χ^2	861.912
	Df	66
	Sig.	0.000

Rotated component matrix[a]

	Component			
	1	2	3	Cronbach's α
QUQ30	0.739			0.800
QUQ31	0.721			0.756
QUQ32	0.816			0.752
QUQ33	0.776			0.693
COMQ24		0.822		0.845
COMQ25		0.753		0.782
COMQ26		0.797		0.818
COMQ28		0.624		0.819
RESQ19			0.786	0.732
RESQ20			0.807	0.751
RESQ22			0.756	0.775
RESQ23			0.850	0.758

Note: [a]converged iterations

Table III. EFA and the first group

KMO and Bartlett's test			Reliability analysis
Kaiser-Meyer-Olkin measure of sampling adequacy		0.866	
Bartlett's test of sphericity	Approx. χ^2	940.736	
	Df	91	
	Sig.	0.000	

Rotated component matrix[a]

	Component		
	1	2	Cronbach's α
ERPQ1		0.895	0.802
ERPQ2		0.906	0.852
ERPQ3		0.915	0.864
FLEXQ46	0.785		0.716
FLEXQ47	0.745		0.683
FLEXQ48	0.803		0.817
FLEXQ49	0.764		0.752
FLEXQ42	0.647		0.635
FLEXQ34	0.820		0.763
FLEXQ35	0.825		0.787
FLEXQ36	0.786		0.750
FLEXQ37	0.761		0.795
FLEXQ38	0.696		0.620
FLEXQ39	0.791		0.749

Note: [a]converged iterations

Table IV.
EFA and the second group

5.2 Exploratory factor analysis (EFA)

As the sample size was relatively small (94) and the number of items (questions) was relatively high (38), we followed the suggestion of Malhotra (2004) and Hair *et al.* (2006) in terms of dividing the items into groups to ensure that the ratio of observations per item for each analysis was at least 4:1. Accordingly, the five variables were divided into two groups. The first group consisted of ERP and Flexibility. Combining the items of both constructs resulted in 18 items for EFA. The second group consisted of quickness, competency, and responsiveness. Combining the items of three constructs resulted in 20 items for EFA.

When performing EFA, and in line with previous studies (e.g. Kohli and Jaworski, 1993; Voon, 2007), we employed the principal component analysis technique (Rietveld and Van Hout, 1993) and applied a varimax rotation to initially extracted factors. We also followed the recommendations of Gray *et al.* (1998) to evaluate the factorial solutions obtained from SPSS 2.0. Items that had either loading (< 0.5) or cross-loading (> 0.3) were removed. This purification process, which was repeated until all measurement scales exhibited clear factor structures, resulted in a reduction in the number of items from 38 to 26.

The remaining 26 items had loaded significantly (loading range from 0.591 to 0.895) on their respective factors, suggesting satisfactory factorability for all the items. Moreover, for each group, the *p*-values for Bartlett's sphericity test was below 0.05 (Bartlett, 1954), and the Kaiser-Meyer-Olkin measure of sampling adequacy was above the threshold of 0.6 (Kaiser, 1974), indicating satisfactory factorability for all the items, as shown in Tables III and IV. In conclusion, the initial findings of the EFA showed that the five constructs had clear factor structures.

5.3 Convergent and discriminant validity

Convergent validity measures the extent to which items on a scale are in theory linked (Harris *et al.*, 2010). For the purpose of the current research, convergent validity was

assessed by observing the average variance extracted (AVE) index, using SmartPLS 2.0 (Wetzels *et al.*, 2009). Table V shows that the AVE values for the agility construct, which consists of four sub-constructs, exceeded the minimum threshold value of 0.5, and that they explained more than 50 percent of the variance in their observable measures (Gotz *et al.*, 2009).

On the other hand, discriminant validity measures the extent to which a latent variable A is different and unique from other latent variables (e.g. B, C, D) (Bagozzi *et al.*, 1991). It also indicates whether a latent variable accounts for more variance in the observed variables associated with it than measurement error or similar external, unmeasured influences; or other constructs within the conceptual framework (Farrell and Rudd, 2009). Discriminant validity was assessed in the current research using the Fornell-Larcker criterion (Fornell and Larcker, 1981). This criterion suggests that a construct should share more variance with its own measures than it shares with other constructs in a model. As such, the correlation of a construct with its indicators (i.e. the square root of AVE) should exceed the correlation between the construct and any other constructs (Fornell and Larcker, 1981). Table VI shows that the root AVE values of the sub-constructs of organizational agility and ERP systems were greater than the corresponding off-diagonal correlations, indicating adequate discriminant validity (Hair *et al.*, 2006).

5.4 Hypotheses testing

We employed SmartPLS 2.0 to test the research hypotheses. This technique does not necessarily require sound theory base, it supports both exploratory and confirmatory research, and accommodates non-normally distributed data and relatively small sample sizes (30-100) (Monecke and Leisch, 2012; Hair *et al.*, 2011; Chin, 1998). SmartPLS provides the path coefficients that are indicators of the model's predictive ability and the strengths of the relationships between constructs (Wixom and Watson, 2001). In this sense, the strength of the path coefficients is determined by the significant level of *t*-values. According to Chin (1998), path coefficients with an absolute *t*-value greater than 1.96 indicate a significance level of 0.05, those with an absolute *t*-value over 2.58 present a significance level of 0.01, and those with an absolute *t*-value over 3.26 present a significance level of 0.001. SmartPLS also provides the squared multiple correlations (R^2)

Variables	AVE
Competency	0.753
Flexibility	0.601
Quickness	0.670
Responsiveness	0.715

Table V.
AVE for agility construct

	Competency	ERP	Flexibility	Quickness	Responsiveness
Competency	0.8677				
ERP	0.4008	0.9539			
Flexibility	0.5851	0.4013	0.7752		
Quickness	0.6148	0.4419	0.66	0.8185	
Responsiveness	0.4226	0.2707	0.59	0.6898	0.8456

Table VI.
Discriminant validity

that indicate the percentage of a construct's variance in the model (Chin, 1998). Henseler *et al.* (2009) suggested R^2-values of 0.67 (substantial), 0.33 (moderate), and 0.19 (weak). Consistent with Becker *et al.* (2012), bootstrapping 500 re-samples rather than 200 re-samples was carried out to produce more stable results in terms of the statistical significance of the path coefficients.

Figure 2 shows that the path coefficient from ERP systems to competency was significant ($\beta = 0.401$, $p < 0.001$). The variance in competency that is explained by ERP systems was weak ($R^2 = 0.161$), indicating that there are significant variables other than ERP systems that contribute to the competency of organizations in the banking sector, though the relationship is significant. Therefore, *H1.1* is accepted.

The path coefficient from ERP systems to flexibility was also significant ($\beta = 0.401$, $p < 0.001$), as shown in Figure 2. The variance in flexibility that is explained by ERP systems was weak ($R^2 = 0.161$), indicating that there are significant variables other than ERP systems that contribute to the flexibility of organizations in the banking sector, though the relationship is significant. Therefore, *H1.2* is accepted.

Figure 2 shows that the path coefficient from ERP systems to quickness was significant ($\beta = 0.442$, $p < 0.001$). The variance in quickness that is explained by ERP systems was weak ($R^2 = 0.195$), indicating that there are significant variables other than ERP systems that contribute to the quickness of organizations in the banking sector, though the relationship is significant. Therefore, *H1.3* is accepted.

The path coefficient from ERP systems to responsiveness was also significant ($\beta = 0.271$, $p < 0.001$), as shown in Figure 2. The variance in responsiveness that is explained by ERP systems was weak ($R^2 = 0.073$), indicating that there are significant variables other than ERP systems that contribute to the responsiveness of organizations in the banking sector, though the relationship is significant. Therefore, *H1.4* is accepted.

Based on the above, we conclude that the first main hypothesis (*H1*) is accepted.

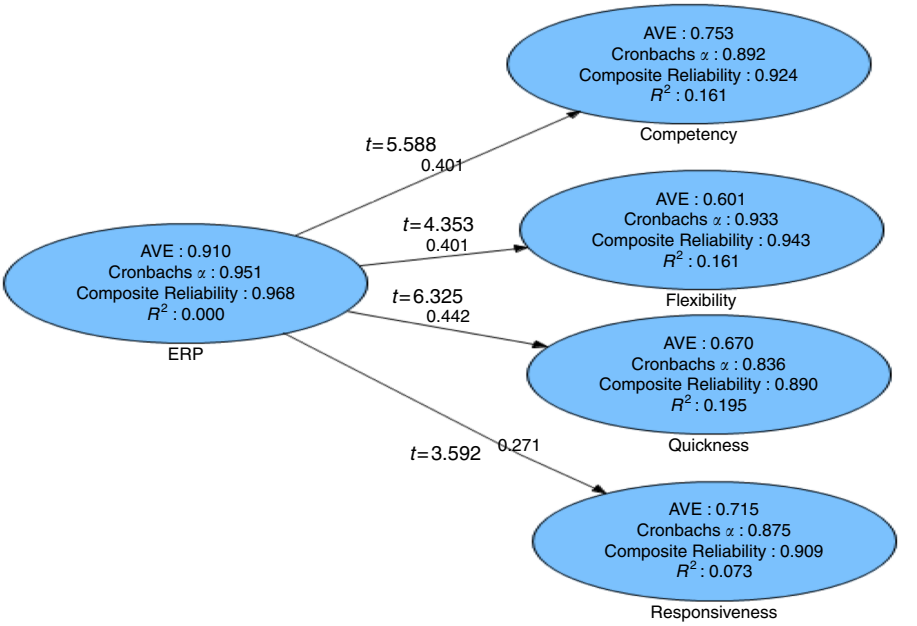

Figure 2.
Path analysis

6. Discussion

Banks are facing slow economies and regulatory uncertainty. In response to these and other industry conditions, banks need to be agile, according to Michael J. McEvoy, principal in the retail banking practice at Novarica, in a recent executive brief (Tellervision, 2011).

Fub *et al.* (2007) stated: "We believe ERP systems to be supportive of banks' reorganisation efforts." Moreover, they asserted that "ERP systems largely possess compliance and regulatory functionalities and can assist banks in fulfilling their regulatory duties." ERP systems can be utilized to improve banks' performance in terms of cost reduction, information, transparency, and quality, and more efficient business processes. Seethamraju and Sundar (2013) indicated that "enterprise resource planning systems in the past have contributed to simplification, standardisation, integration, and automation of processes, but their influence on the firm's ability to build agility is ambiguous." This paper aims to explore the influence of ERP systems usage on banks' agility in the Middle East.

A new model was developed based on the research of Zhang and Sharifi (1999) and Zain *et al.* (2005). This model was tested in relation to the banking sector in the Middle East. The main contribution of this research is in the development of a new model for the relationship between ERP systems usage and agility in the banking sector. This research extends the precedent literature by examining the suggestion that if organizations need to decrease uncertainty, unpredictability, and volatility resulting from a changeable business environment, they will have to give more attention and focus to ERP systems. The study will enrich agility literature and evaluate the importance of ERP systems in coping with uncertainty in the business environment.

Despite the results showing that the impact of ERP systems usage on banks' agility is significant, the variance in banks' agility that is explained by the use of ERP systems is weak, as ERP systems explained about 16.1 percent of the variance in the competency item, 16.1 percent of the variance in the flexibility item, 19.5 percent of the variance in the quickness item, and 7.3 percent of the variance in the responsiveness item. This indicates that there are other significant variables that contribute to organizational agility in the banking sector within the Middle-East region. Implementing ERP systems in banks may replace IT and business procedures, though this will negatively influence the ability of banks to maintain competitive advantage, according to Fub *et al.* (2007). Therefore, ERP systems usage in banks may not support the competency of banks sufficiently, and may not enhance banks' agility. Moreover, the implementation of ERP systems in banks increases standardization, and this may lead to loss of flexibility (Fub *et al.*, 2007). ERP systems aim to make ISs tightly integrated for control and visibility, whereas in order to achieve agility, ISs should be loosely coupled (Seethamraju and Sundar, 2013). Therefore, ERP systems usage in banks may have a negative impact on banks' flexibility, and this may not lead to achieve banks' agility sufficiently. In addition, some bank services such as procure to pay and order to cash are not likely to change rapidly, and building agility into those services is not found to be necessary (Seethamraju and Sundar, 2013). Thus, it may not be important for all major services in the banks supported by ERP systems to be quick and responsive. Therefore, ERP systems usage in banks may not support the quickness and responsiveness of banks adequately, and this may not lead to achieve banks' agility sufficiently.

According to Genoulaz and Millet (2006), human resources and workforce management are considered as one functional area that service organizations use more than their manufacturing counterparts. Genoulaz and Millet stated that "manufacturing organizations may use ERP systems to integrate all departments and achieve better visibility and control

by eliminating interfaces; but human resource management is rarely fully integrated." Most banks do not extend their current ERP systems outside limited functional areas. Therefore, implementation of ERP systems in banks could have limited influence on some banks' processes, and this may not lead to the delivery of agility in banks to any significant degree. This is in line with the results of this paper, which shows that despite ERP systems usage in Middle-Eastern banks impacts significantly on the banks' agility, the variance of banks' agility that is explained by the use of ERP systems is weak. This indicates that ERP systems usage may not influence sufficiently the current agility drivers (competency, flexibility, quickness, and responsiveness) in Middle-Eastern banks and that there may be other significant variables that contribute to agility in the banking sector.

Our results show that building agility is not dependent only on technology, but could also be dependent on other organizational factors such as organizational politics, culture, environments, structures, routines, and business processes. This result is consistent with recent research (Seethamraju and Sundar, 2013), which has indicated that in addition to technology, there are other factors such as organizational culture, business process management capability, and process characteristics specific to a particular organization that have an influence on building agility.

In order to expand the role of IT in enhancing a bank's agility, the management should ensure that a proposed software system will be in line with business processes. According to Adrian *et al.* (2002), "investments in technology should have the objective of improving current business models and not merely replacing an existing process or operation, but to employ the application to improve the way in which business is done."

Despite the fact that the variance of a bank's agility that is explained by ERP systems usage is weak, the importance of ITs/ISs in the banking sector is expected to continue to grow in the coming years. According to Seethamraju and Sundar (2013) and Adrian *et al.* (2002), the utilization of IT is expected to increase, particularly with the emergent, large-scale development of e-commerce, e-business, and web services. These technologies will create opportunities for banks to work efficiently with suppliers, customers, and partners. Furthermore, these technologies may enable banks to build alliances with other banks and organizations. This collaboration will increase banks' ability to adapt to unexpected and uncertain situations and to changes in the environment.

7. Implications for practitioners

The contribution of this research lies in the assessment of the impact of ERP systems usage on banks' agility in the Middle East. Essentially, we argue that ERP systems usage has significant impact on banks' agility in the Middle East in the current business environment but the variance of banks' agility that is explained by the use of ERP systems is weak, and have found empirical support for this result. The results of this research investigation provide banking practitioners and investors with valuable direction. Success in achieving agility is not fully dependent on ERP systems usage in banks in the Middle East. Implementing and managing ERP systems are expensive and time consuming. Before investing in ERP systems, banking practitioners and investors in the Middle East should be aware that the successful implementation of ERP systems may not lead to the achievement of sufficient competency, flexibility, quickness, and responsiveness, according to the results of this research, and that this may not deliver banking agility sufficiently. Banking practitioners should therefore consider organizational factors alongside ERP systems and other technologies in order to increase the chances of banks achieving sufficient agility.

8. Conclusion and future work

The problem of how organizations can cope with uncertainty, unpredictability, and changes in the environment is an important topic for both academics and professionals. In order to solve this problem, organizations need to be agile. Technology could contribute to building agile organizations. ERP systems can be considered as key pillars that support organizations to achieve their business goals. This research aims to investigate the impact of ERP systems usage on agility in organizations.

We developed a new model based on the work of Zhang and Sharifi (1999) and Zain *et al.* (2005). This model has two parts: the first includes an independent variable, namely ERP systems usage; the second includes the dependent variables responsiveness, competency, quickness, and flexibility. We tested this model using the banking sector in the Middle East. The results show that despite the impact of ERP systems usage on banks' agility is significant, the variance of banks' agility that is explained by the use of ERP systems is weak. The dependent variable most influenced by ERP systems usage is quickness, with a variance 19.5 percent. Moreover, the results of the research show that the ERP systems usage in Middle-Eastern banks does not influence sufficiently on organizational agility's drivers (competency, flexibility, quickness, and responsiveness).

This study concludes that building agility is not fully dependent on technology, specifically ERP systems, but that it could also be dependent on other factors such as organizational politics, culture, environments, structures, routines, and business processes. ERP systems enhance the integration of management levels, the linking of enterprises, simplification, standardization, co-ordination between functional areas, executing business processes across the firm, co-ordination of daily activities, efficient responses to customer orders, and the provision of valuable information for improving management decisions. But the variance of bank agility that is explained by ERP systems is weak, according to this research. This is consistent with Seethamraju and Sundar (2013), who stated that it may not be necessary for all major standard processes supported by ERP systems to be agile. They added that management aims to achieve centralization of control by tightly integrating its IT infrastructures, while agility could be delivered through loosely coupled systems and technologies.

Future research can apply the same research model to another geographical area, such as the West, in order to investigate whether ERP systems usage has a significant effect on organizational agility in the banking sector within that region, or whether it has no effect on organizational agility, regardless of the region. Furthermore, new research could be conducted to study the impact of using other technologies and ISs such as web services and e-commerce on building agility. Future research should also look at the drivers of organizational agility, given the difference in the characteristics between service sectors and manufacturing sectors.

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Appendix 1

Items used in measuring ERP usage

- our bank uses the ERP system very intensively (many hours per day, at work);
- our bank uses the ERP system very frequently (many times per day, at work); and
- overall, our bank uses the ERP system a lot.

Appendix 2

Items used in measuring agility

(1) Competency

- our bank has the ability in challenging and outperforming new entries to market;
- our bank has the ability in predicting the trend of service and/or product life cycle;
- our bank has the ability in maintaining its position among its direct competitors in local market in the current position;
- our bank has the ability in maintaining its position among its direct competitors in global market in the current position;
- our bank has the ability in predicting its market share considering the intensity of competition; and
- our bank has a strategic basis for competition (competition on: price, product differentiation, time, quality, service).

(2) Flexibility

- our bank has the ability to operate efficiently at different levels of output;
- our bank has the ability to effectively increase or decrease aggregate services and/or production in response to customers;
- our bank can maintain performance standards when producing a wide variety of services and/or products;
- our bank can produce different service and/or product types without major changeover;
- our bank can build different services and/or products;
- our bank can produce, simultaneously or periodically, multiple services and/or products in an operating cycle;
- our bank can vary service and/or product combinations from one period to the next;
- employees in our bank can perform different types of operations effectively;

- employees in our bank can perform a broad range of banking tasks effectively;
- employees in our bank can operate various types of banking systems;
- employees in our bank can be transferred easily between bank units;
- our bank is able to increase the capacity (e.g. output per unit time) of banking systems when required;
- our bank is able to increase the capability (e.g. quality) of banking systems when required;
- our bank is able to change capacity of available facilities to meet fluctuations in demand; and
- our bank has the ability to effectively respond to changes in planned delivery times.

(3) Quickness

- our bank can quickly change the quantities for our services and/or products;
- our bank can changeover quickly from one service and/or product to another;
- our bank can launch new services and/or products into the market; and
- our bank can quickly discover changes in customer preferences.

(4) Responsiveness

- our bank makes quick decisions on reaction to price change;
- our bank has the tendency to perceive changes in customer needs;
- our bank periodically reviews the service and/or product development;
- our bank usually makes regular interdepartmental meetings on reaction to external changes;
- our bank responds quickly to competitors' campaigns;
- interdepartmental activities are well coordinated in our bank;
- customer compliments are perceived in our bank;
- our bank manages to implement plans on time; and
- involved departments in our bank coordinate service and/or product changes.

About the author

Dr Faisal A. Aburub is a Head of MIS Department at the University of Petra, Amman, Jordan. He holds a PhD degree in Information Systems from the University of the West of England, 2006, Bristol, UK. Dr Faisal has more than eight years of experience in information systems including research and development. His research interests are mainly focussed on business process modeling, business process improvement building on process modeling, bridging the gap between system models and business process models, and e-learning systems. Dr Faisal A. Aburub can be contacted at: faburub@uop.edu.jo