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Effects of decision rationality on ERP adoption extensiveness and organizational performance

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Abstract

Purpose – The purpose of this paper is to examine how decision rationality affects ERP adoption extensiveness and subsequently, organization performance. The mediating roles of system usage and user satisfaction on the relationship between adoption extensiveness and organizational performance are also examined.

Design/methodology/approach – This study was based on a questionnaire survey of 976 public-listed companies and 200 unlisted manufacturing companies. Responses of 93 ERP adopters were analyzed.

Findings – ERP adoption extensiveness is significantly affected by the overall measure of expected economic benefits, but not by any of the economic benefit type individually. On the other hand, mimetic pressure individually affects ERP adoption extensiveness, but not the overall measure of institutional pressures. ERP adoption extensiveness is significantly associated with organizational performance, and the mediating roles of system usage and user satisfaction are supported.

Research limitations/implications – This study has the limitations associated with questionnaire-based research and its small sample size may also limit the generalizability of its findings.

Practical implications – The high emphasis on operational benefits of ERP adoption and the significant effect of mimetic pressure on ERP adoption extensiveness imply that organizations in Malaysia are largely "followers" of the technological innovation and generally have yet to exploit the full potentials of their ERP systems. Government agencies may need to play a more active role to facilitate fuller utilization and adoption of the higher end ERP applications. Vendors of ERP systems may need to review their strategies to increase their sales of ERP systems to the smaller business enterprises.

Originality/value – The paper addresses the relatively void in literature on the link between decision rationality and technology adoption extensiveness and the subsequent organizational performance in the context of an emerging economy.

Keywords Organizational performance, Enterprise resource planning (ERP), Decision rationality, Economic benefits, Institution pressures, System usage

Paper type Research paper

1. Introduction

Advances in information and communications technologies (ICT) have significantly changed the way businesses operate. Many business processes are simplified and automated to enhance cost competitiveness. Enterprise resource planning (ERP) system

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is a technology innovation that allows a seamless flow of real time information in an organization through integration of its business processes to facilitate information sharing among its various operating units (Pishdad and Haider, 2013). Even though it is one of the increasingly sought-after system software in the new century (Basoglu *et al.*, 2007), ERP systems do not necessarily provide the benefits expected.

The failures of many ERP systems might be due to the serious challenges encountered during ERP system implementation (Nicolaou, 2004; Kim *et al.*, 2005) or the ERP system is a poor "fit" for the adopter firm (Hong and Kim, 2002). Many prior studies on ERP system focus largely on the critical success factors for ERP adoption (Bingi *et al.*, 1999; Umble *et al.*, 2003; Soja, 2006; Doom *et al.*, 2010; Wickramasinghe and Gunawardena, 2010). Generally, past findings indicate that realization of the benefits of ERP system is highly dependent on the environment and organizational context (Huang and Palvia, 2001), and in particular, the skills and capabilities that organizations possess (Basoglu *et al.*, 2007; Law and Ngai, 2007; Francoise *et al.*, 2009).

Relatively few studies, however, have examined decision rationality for ERP adoption, and how decision rationale affects subsequent system success and organizational performance. According to Alalwan and Weistroffer (2012), research studies that focus on the technology adoption phase is scarce even though understanding why organizations adopt a technology is important for successful implementation of the technology. Prior studies have often assumed improved economic efficiency from new technology adoption as the motivator for ERP system adoption. Only a few studies (Teo *et al.*, 2003; Ugrin, 2009) examine the influences of other possible external forces that might affect the technology adoption decision. Teo *et al.* (2003) and Ugrin (2009) reported that institutional factors influenced technology adoption decision intent. An understanding of the motives for ERP adoption is important because the rationale used to justify the ERP adoption decision may contribute to the subsequent success or failure of the ERP system implemented. Organizations that have good justifications and clear objectives for adoption of technology innovations, such as the ERP system, are more ready to benefit from their technology adoption (Sammon *et al.*, 2003). The earlier mixed findings on the benefits of ERP adoption (Hendricks *et al.*, 2007; Hunton *et al.*, 2003; Nicolaou, 2004; Soh and Sia, 2004; Wieder *et al.*, 2006) may be attributable to differences in the decision rationality for ERP adoption in organizations. According to Emerson *et al.* (2009), weak and unclear objectives could be a major reason for ERP catastrophe. Hence, this issue warrants further investigation.

With globalization and increasing investments of multinational corporations in the developing countries, many local companies in the developing countries, despite lacking the needed capabilities and resources, are pressured to replace their legacy systems with more sophisticated information systems, such as the ERP system (Koh *et al.*, 2006). A key question of interest to both academic researchers and practitioners is: would decision rationality for ERP adoption affect investments in extended ERP applications and the subsequent organizational performance? The relationship between decision rationality for ERP system adoption and the subsequent organizational performance is relatively unexplored, especially in developing countries such as Malaysia. This study, therefore, intends to address this relative void in the literature by extending the earlier studies on technology adoption decision intent (Teo *et al.*, 2003; Ugrin, 2009) by investigating whether decision rationality for ERP adoption would affect ERP adoption extensiveness and subsequently, the organizational performance. In addition, mere system implementation may not impact

organizational performance (Delone and McLean, 1992; Le Blanc and Kozar, 1990). Hence, the mediating roles of system usage and user satisfaction on the relationship between ERP adoption extensiveness and organizational performance are also examined in this study.

The remainder of this study is organized as follows. The next section provides a brief background on the ERP market in Malaysia, followed by a review of the literature and development of the research framework and hypotheses. The methodology section describes the research design and data collection. The following section presents the results, and the final section summarizes the findings of study and discusses their implications.

2. ERP market in Malaysia

After the establishment of the Multimedia Super Corridor (MSC) in 1995, several types of incentives are given to organizations to promote development of their ICT capabilities to meet the challenges and competition in the global marketplace. ERP system is one of the technologically advanced information systems that is increasingly being adopted by organizations in Malaysia to enhance their capabilities to compete (Supramanian and Kuppusamy, 2010). However, according to Supramanian and Kuppusamy (2010), the adoption of the ERP system by organizations in Malaysia is a fairly recent phenomenon, as only about 50 per cent of the organizations surveyed acknowledged that their ERP systems were installed only one year or more ago, and most of the ERP adopters were from the manufacturing sector.

In Malaysia, similar to ERP adoption in other parts of the world, adoption of ERP systems often involves high investment costs and many of the ERP projects have failed. According to Khaleel *et al.* (2011), one of the important factors that inhibits ERP adoption by SMEs in Malaysia is the perception among SMEs that the ERP systems are complex and not compatible to their business needs. Many SMEs opine that their business operations require only simple ICT applications. In addition, the high costs, skills and time requirements, coupled with the fear of failure, are contributing to the low rate of ERP adoption among the smaller business enterprises in Malaysia. Their findings are corroborated by the CEO of a local ERP provider, who opines that ERP implementation in Malaysia often requires extensive customization and long implementation period because Malaysia is a largely resource-based country and many ERP adopters in the country are involved in process-based manufacturing (Yap, 2014). The extensive customization needed has discouraged many smaller businesses from adopting the ERP systems. The low rate of ERP adoption and the hesitation to invest in the ERP systems would not augur well for many of those SMEs, which are venturing into the global market, as the non-adoption of this enabling technology would adversely affect their operational efficiency and hence, their competitiveness in the global market.

3. Literature review

One of the important findings highlighted in the earlier studies is that implementing an ERP system is more complex than that of installing a new programme; it requires a lot of careful planning, substantial management effort and a large investment in time and money. Implementation of the ERP system often necessitates a total overhauling of the existing business processes and procedures, and the new way of doing business needs to be embedded in the organization's culture. Hence, organizations must adopt ERP system for the right reason to ensure both tangible

and intangible benefits expected to be realized from their new systems can justify their ERP system investments.

Prior research studies on technology adoption largely assume economic rationality in decision making and that management decisions are mostly based on efficiency consideration (Koh *et al.*, 2006; Spathis and Constantinides, 2003; Zhang *et al.*, 2005). However, there are other factors, such as institutional forces in the environment that could significantly influence decision making in the organizational setting (Teo *et al.*, 2003; Ugrin, 2009).

3.1 Theoretical paradigms underpinning technology adoption decision

3.1.1 Economic-based or rational actor paradigm. The economic-based approach, such as the transaction cost theory or transaction cost economics (Williamson, 1985), emphasizes on the technical and economic analyses of costs and benefits to provide rational economic justifications for transactions undertaken in organizations. In the context of ERP system adoption, the economic-based or rational actor approach predicts that the new system will be adopted when the expected benefits, in terms of enhanced organizational performance, exceed the associated costs of the new system. Several technology adoption models, such as the TOE framework (Tornatzky and Fleischer, 1990) and model by Iacovou *et al.* (1995), are developed largely based on the analyses of the technical and economic perspectives relating to the new technology adoption.

3.1.2 Institutionalist paradigm. The approach takes a sociological perspective to explain how institutional forces in the environment influence decision making in organizations. The institutional theory explains how the need for legitimacy drives organizations to adhere to established norms, procedures and practices to gain stability and acceptance to survive in their social environment (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Ketokivi and Schroeder, 2004; Scott, 2014). According to Meyer and Rowan (1977), conformity with established rules and procedures rather than the rational efficiency factor determines legitimacy of organizations, especially those highly institutionalized organizations. Legitimacy, which implies public acceptance and vote of confidence that the business is conducted in the most acceptable manner, provides advantages such as increased survival prospect (Meyer and Rowan, 1977), reduction in uncertainty (Liao, 1996), improved capability in acquiring resources and enhanced relationship with business partners (DiMaggio and Powell, 1983). On the other hand, failure to adapt to these established norms and values could expose organizations to unnecessary legal actions or claims of negligence (Meyer and Rowan, 1977) and many other issues that would potentially damaging to the business (Fogarty, 1996). The perceived benefits from conformity to established procedures and practices have motivated many organizations to conform voluntarily. The desire to conform could directly or indirectly influence the choice of investments in organizations.

According to Scott (2014), legitimacy is a fundamental condition of social existence and institutional stability. Scott (2014) identifies three pillars as the key elements that support institutions. The three pillars are the regulative systems, normative system and cultural-cognitive system, and these three pillars resemble DiMaggio and Powell's (1983) three mechanisms of structural isomorphism, which are the coercive pressure, normative pressure and mimetic pressure. The three mechanisms or pressures force organizations under the similar environmental setting to adopt similar business practices or structures to resemble each other. Such institutional pressures are expected to affect technology adoption decision in organizations.

Coercive pressure is largely a result of the resource dependence factor (Iacovou *et al.*, 1995; Teo *et at.*, 2003). An organization, which is highly dependent upon a resource provider, is pressured to accept rules or procedures imposed by that resource provider. The resource providers often are the government, dominant business partners and parent companies (Benders *et al.*, 2006). Coercive pressure causes behaviour that is primarily to avoid sanctions and to ensure survival of the organization rather than to enhance its economic performance.

Normative pressure arises from a sense of duty or obligation of members to comply with their professional body's or trade association's pronouncements (Batenburg *et al.*, 2008). An organization would also experience normative pressure from dealings with their trading partners, such as their customers and suppliers. Technology adopted by the suppliers or customers of an organization can increase its inclination to adopt the same technology (Pishdad and Haider, 2013).

Mimetic pressure is due to ignorance and uncertainty of what the best practice to adopt. Under such circumstances, many organizations resort to imitating or replicating practices or structures of successful organizations in their industries to avoid search cost and to minimize risk of being the first adopter (DiMaggio and Powell, 1983). Successful adoption of the latest technology by competitors could drive an organization to adopt the similar technology to avoid being left behind (Benders *et al.*, 2006).

3.2 Empirical studies on technology adoption

3.2.1 Economic rationale for ERP adoption decision. Based on the resource-based view (Barney, 1991), firms can develop and sustain their competitive advantages by exploiting and developing resources, such as competencies, assets, know-how and capabilities, that are valuable and not easily imitable (Mata *et al.*, 1995). E-business technologies, such as the ERP system, provide new capabilities that could be exploited by organizations to gain and sustain their competitive advantages (Parker and Castleman, 2009).

Past studies indicate that some of the significant motivations for ERP system adoption are its capabilities to streamline all data and processes to enhance business process efficiency, data accuracy and timeliness (Davenport, 1998; Nah *et al.*, 2001; Spathis and Constantinides, 2003; Koh *et al.*, 2006). Other key determinants of ERP adoption include cost reduction, growth in sales revenue and enhanced competitive advantage (Spathis and Constantinides, 2003; Russell and Hoag, 2004; Zhang *et al.*, 2005; Law and Ngai, 2007; Emerson *et al.*, 2009; Shiau *et al.*, 2009).

Chand *et al.* (2005) developed an ERP scorecard to assess the level of success of ERP system adoption based on Zuboff's (1985) success concept of automate, informate and transformate. Automate-level benefits arise from the streamlining and improvement in data quality. Informate-level benefits are derived from enhanced customer service delivery and better management decision making. Transformate level focuses on development of competitive advantages by embracing new and innovative strategies such as initiating strategic partnerships with customers and suppliers. Prior studies have shown that the technical and operational benefits at automate and informate levels are still very much emphasized in most ERP system adoption decisions (Jang *et al.*, 2009; Kamhawi, 2008). Iacovou *et al.* (1995) similarly found that perceived economic benefits and pressure from trading partners have great influences on EDI adoption and integration level of the seven small business enterprises.

3.2.2 Institutional influences on ERP adoption decision. Organizations may adopt technology for reasons other than those for improved economic efficiency. Institutional theory may provide an explanation alternative to that based on economic rationality for ERP system adoption. For example, Tingling and Parent (2004), in their longitudinal study on the e-mail system adoption in a Canadian bank, found that system legitimacy and acceptance by other powerful and superior organizations were crucial in evaluation of the credibility of the system. Hence, they opine that technology selection do not always involved rigorous analytical and evaluation process, but may entwine with ceremonial rules and the organization's cultures and experiences. Earlier findings similarly indicate that organizations adopted the ERP system largely to gain recognition from business partners or be among the earliest adopters of state-of-the-art technology (Batenburg *et al.*, 2008). Institutional influences, such as mimetic and normative pressures, were particularly important on the new ERP adopters, who were uncertain of the benefits of ERP systems and where the ERP system could enhance organizational interactions in the organization's supply chain (Ugrin, 2009). Buonanno *et al.* (2005) also highlighted that ERP adoptions in the larger organizations were very much influenced by the need to conform to requirements of their controlling companies (coercive pressure).

3.2.3 ERP adoption and organizational performance. Despite the numerous benefits expected from the ERP system, the relationship between ERP adoption and organizational performance is inconclusive (Davenport, 1998; Hunton *et al.*, 2003; Nicolaou, 2004; Soh and Sia, 2004; Chand *et al.*, 2005; Spathis and Ananiadis, 2005; Wieder *et al.*, 2006; Wier *et al.*, 2007; Hendricks *et al.*, 2007; Kamhawi, 2008; Supramaniam and Kuppusamy, 2010). According to DeLone and McLean (1992), full participation and users' support are crucial for realization of benefits of the ERP system implemented. Similarly, Croteau and Bergeron (2001) reported that information technology alone would not affect organizational performance, and the technology must be properly utilized for information technology to affect performance. Morabito *et al.* (2010) attribute performance differences between IT adopters to "IT organizational assimilation capacity" and concur that IT-related advantages could only be realized by integrating IT with organizational complementary resources or capabilities to improve quality of decision making.

System usage and user satisfaction are the two frequently used measures of information systems success. Past studies have indicated that system usage and user satisfaction are intervening variables linking system implementation and organizational performance (Le Blanc and Kozar, 1990; Straub *et al.*, 1995; Wierenga and Oude Ophuis, 1997; Yu, 2005; Zhang *et al.*, 2005). High system usage reflects high management commitment and shared belief and understanding of the IS capabilities (Cohen and Toleman, 2006). It may be similar to or a crucial element of "IT organizational assimilation capacity" (Morabito *et al.*, 2010) necessary for better decision making to enhance organizational performance. Studies by Le Blanc and Kozar (1990), Straub *et al.* (1995) and Yu (2005) also indicated that user engagement or system usage is necessary to ensure the benefits expected from the new system are accordingly realized to impact organizational performance. As user resistance is a key hindrance to information system success (Basoglu *et al.*, 2007), user satisfaction, which reflects user acceptance of the system, is crucial for system success. User involvement in system design and implementation would align system capabilities to users' needs to ensure user satisfaction of the system output (Zhang *et al.*, 2005; Yaseen, 2009), and that enhances both system effectiveness and decision performance (Gatian, 1994).

4. Research framework and hypotheses

4.1 Research framework

Review of the earlier IS literature indicates that IS/IT adoption decision may be influenced by both economic and institutional factors (Spathis and Constantinides, 2003; Russell and Hoag, 2004; Zhang *et al.*, 2005; Law and Ngai, 2007; Emerson *et al.*, 2009; Shiau *et al.*, 2009; Hollenstein, 2004; Bayo-moriones and Lera-Lopez, 2007, Ugrin, 2009). ERP system adoption decision based on economic rationale would emphasize on organizational efficiency enhancement, while ERP system adoption decision based on institutional pressures would emphasize on conformity to the norms of accepted practices. The decision rationale for ERP adoption is expected to affect ERP adoption extensiveness and that will subsequently affect organizational performance. The inconclusive findings on the relationship between IS/IT adoption and organizational performance may be due to the effects of two intervening variables, system usage and user satisfaction, and these two variables are expected to mediate the relationship between ERP adoption extensiveness and organizational performance. Figure 1 presents the research framework for this study.

4.2 Hypotheses

Adoption of ERP system involves not only huge capital investments but also radical changes to the organization's existing processes. Gunasekaran *et al.* (2006) highlighted the importance of conducting serious assessments by organizations on their system needs and of having the right reasons for adopting their ERP systems. They attributed the failure of many organizations to fully realize the benefits of their ERP systems to weak planning and justification processes. Stringent investment appraisal process to evaluate the system benefits is a necessity and many prior studies have indicated that IS/IT decisions are often dominated by system costs and benefits considerations (Tingling and Parent, 2004; Koh *et al.*, 2006; Laukkanen *et al.*, 2007; Jang *et al.*, 2009; Shiau *et al.*, 2009). Early adopters (pioneers) are more often influenced by the potential economic benefits of the ERP system than late adopters (followers) who are likely to adopt ERP due to institutional pressures. ERP adoption decision based on economic reasoning is expected to include more careful planning and extensive analysis of the system capabilities than ERP system adopted due to institutional pressures. Iacovou *et al.* (1995) found that EDI adopters, who did not perceive any economic advantage of EDI adoption but were pressured by trading partners into adopting EDI, were unwilling to spend sufficiently in their EDI systems, and as a consequence, the actual impact on their performance was only limited. Thus, an organization, which adopted

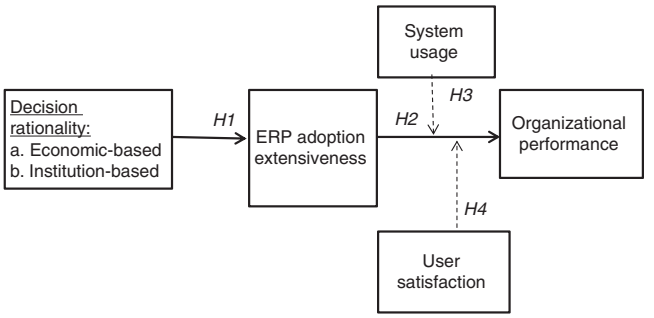

Figure 1.
Research framework

ERP system for its expected economic benefits, will likely to have more extensive ERP applications as compared to an organization which adopted the ERP system due to institutional pressures. The first hypothesis, *H1*, is formulated as below:

H1. Economic-based factors have a more significant impact on ERP adoption extensiveness than the institutional-based factors.

A key attribute of the ERP system is its ability to integrate business functions within the organization to allow a seamless flow of information across business functions to improve process efficiency and information quality for management decision making and that subsequently, is expected to improve organizational performance. Nicolaou (2004) and Wieder *et al.* (2006) reported that organizational performance increased with ERP system maturity. Spathis (2006) also argued that organizations might not be able to realize some potential benefits of their enterprise systems (ES) due to the infancy of their ES and system benefits would accrue in the longer term with ES complexity (Poston and Grabski, 2001). In this study, ERP adoption extensiveness reflects system complexity and maturity. Hence, the second hypothesis, *H2*, formulated is as follows:

H2. There is a positive relationship between ERP adoption extensiveness and organizational performance.

Prior studies indicate the relationship between ERP adoption and organizational performance is inconclusive. The failure of an ERP system to enhance organizational performance is often due to non-alignment of the system capabilities to users' needs. As an information system does not create direct value for an organization (Le Blanc and Kozar, 1990), the system must be fully utilized for full exploitation of the system's capabilities (Wierenga and Oude Ophuis, 1997; Bailey and Pearson, 1983) or to achieve high "IT organizational assimilation capacity" (Morabito *et al.*, 2010) necessary for improved organizational performance. Consistent with the argument by Le Blanc and Kozar (1990) that mere adoption of ERP system does not necessarily lead to improved organizational performance, unless the ERP system is fully utilized and users' needs are satisfied. Therefore, this study hypothesizes that both system usage and user satisfaction mediate the relationship between extensiveness of ERP applications adopted and organizational performance. The third and fourth hypotheses, *H3* and *H4*, are as follows:

H3. System usage mediates the relationship between ERP adoption extensiveness and organization performance.

H4. User satisfaction mediates the relationship between ERP adoption extensiveness and organization performance.

5. Methodology

5.1 Sample and data collection

This study was based on a questionnaire survey of all the 976 companies listed in the BURSA Malaysia (formerly known as the Kuala Lumpur Stock Exchange) at the end of 2010. Out of the 976 public-listed companies, 861 companies were listed of in main market of Bursa Malaysia and 115 companies were listed in its ACE market. In addition, another 200 unlisted manufacturing companies were selected from directory of the Federation of Malaysian Manufacturers for 2010, using the systematic sampling technique. The intention of including an additional 200 unlisted companies in the questionnaire survey was to increase the number of responses received for analysis because the response rate for questionnaire survey in Malaysia is generally expected to be low (±10 per cent).

A structured questionnaire was developed for data collection. The questionnaire items were adapted from prior studies (Teo *et al.*, 2003; Buonanno *et al.*, 2005; Chand *et al.*, 2005; Chang *et al.*, 2008; Law and Ngai, 2007; Kamhawi, 2008; Chung *et al.*, 2009; Shiau *et al.*, 2009). The questionnaire consisted of seven main sections: Section 1 focused on the expected economic benefits and the perceived institutional pressures that influenced ERP adoption decision; Sections 2 and 3 gathered data relating to user satisfaction and system usage, respectively; Section 4 included items to measure organizational performance; Section 5 required respondent to indicate the extensiveness of ERP applications adopted by his/her organization; the last section gathered the demographic data of the respondent and his/her organization. The questionnaire items required the respondent to rate his/her responses on a five-point rating scale. The questionnaire was first pre-tested on five business managers to gauge the relevance and their understanding of the questionnaire items asked. Based on the comments received, minor amendments were made to the wordings used in some of the questionnaire items.

Copies of the questionnaires were mailed to senior-level managers of the sample organizations. Two weeks after mailing the questionnaires, organizations which had not responded were contacted via telephone and e-mails to remind the managers of the questionnaire mailed earlier. A web-based questionnaire was also created to provide managers the option to complete the questionnaire online. At the end, a total of 136 usable responses were received online or via normal mail; 93 were ERP adopters and 43 were non-ERP adopters. Since the focus of this study is on extensiveness of ERP adoption, only responses from the 93 ERP adopters were analyzed, using the SPSS statistical package.

5.2 Measurements of variables

The expected economic benefits comprised the operational, managerial and strategic benefits (Buonanno *et al.*, 2005; Kamhawi, 2008; Shiau *et al.*, 2009), while the institutional forces were the coercive, mimetic and normative pressures (Teo *et al.*, 2003; Ugrin, 2009). ERP adoption extensiveness was measured by the extensiveness of ERP modules implemented. Organizational performance was measured by both financial and non-financial performance measures. System usage was measured by the extent of usage of system data and output for various purposes. User satisfaction was measured by user's perceived quality of the ERP system output. Organizational size and industry affiliation, which were expected to influence ERP adoption extensiveness, were used as control variables in this study. Organizational size was represented by the organization's annual sales turnover. Table I summarizes the operational definitions of the variables and sources of adaptation.

The reliability tests of measures of the variables examined in this study show that all Cronbach Alpha coefficients exceed the acceptable level of 0.70 (Nunnaly, 1978). The lowest is 0.794 for normative pressure and the highest is 0.945 for organizational performance.

6. Results and discussions

Out of a total of 136 completed questionnaires received, 93 were from ERP adopters and 43 were from non-ERP adopters. The non-ERP adopters were omitted from the sample for analysis in this study. Table II summarizes the profiles of the respondents and their organizations. Top management, comprising chief executive officers, directors and vice

Variable name	Operational definition	Measurement items	Adapted from
Economic benefits	Operational benefits (automate level)	8	Buonanno *et al.* (2005), Chand *et al.* (2005), Kamhawi (2008), Shiau *et al.* (2009)
	Managerial benefits (informate level)	6	
	Strategic benefits (transformate level)	8	
Institutional pressures	Coercive pressure refers to the influences asserted by dominant trading partners and parent company to adopt the ERP system	6	Teo *et al.* (2003), Ugrin (2009)
	Mimetic pressure refers to voluntary and conscious action undertaken by an organization to mimic its leading competitors' actions to adopt ERP	3	
	Normative pressure refers to organization's unconscious act of adopting ERP to comply with practices approved by its industry or trade associations	2	
ERP adoption extensiveness	Extensiveness of ERP modules adopted	9	Chang *et al.* (2008), SAP Global (2008)
System usage	Extent of usage of system output and data for various purposes	7	Straub *et al.* (1995), Chung *et al.* (2009), Jeyaraj and Sabherwal (2008)
User satisfaction	Perceived quality of ERP system output	9	Law and Ngai (2007), Kamhawi (2008)
Organization performance	Financial measures	3	Wieder *et al.* (2006), Law and Ngai (2007), Kamhawi (2008)
	Non-financial measures	7	

Table I. Operational definitions of variables and sources of adaption

presidents, constituted 15.05 per cent of total respondents. IT managers and consultants formed 48.39 per cent of the respondents, while 11.83 per cent of the respondents were accounting and finance managers. The other managers made up the 24.73 per cent of the total respondents. Almost 80 per cent of the respondents had more than ten years of working experience.

The sample mostly consisted of firms from the manufacturing sector[1] (59.14 per cent), while those from the trading and services sector[2] and the construction sector[3] constituted 22.58 and 12.90 per cent of the total sample firms, respectively. About 45.16 per cent of the sample firms were public-listed companies and 33.33 per cent were privately owned firms. Foreign-owned firms formed 13.98 per cent of the sample. In terms of size, 69.89 per cent of the sample firms had annual sales turnover of more than RM10 million and 44.08 per cent of the firms employed more than 500 employees.

The descriptive statistics of the variables are shown in Table III. The overall mean score for expected economic benefits is 4.07 and the individual mean scores for operational, managerial and strategic benefits are 4.29, 4.09 and 3.82, respectively. The findings of this study indicate that ERP adopters in Malaysia still largely emphasize on the operational (automate level) benefits of ERP systems rather than on the strategic (transformate level)[4] benefits. This may be because their investments in ERP are relatively recent, as reported by Supramanian and Kuppusamy (2010) that about 50 per cent of the ERP systems in their sample were installed only one year or more ago. Chand *et al.*, (2005), Kamhawi (2008) and Jang *et al.* (2009) also found strong emphasis on operational benefits of ERP systems in their studies. The three most important perceived

	Total	%
Job designation		
Top management (CEOs and directors)	14	15.05
IT managers/consultants	45	48.39
Accounting and finance managers	11	11.83
Other managers	23	24.73
	93	100.0
Work experience		
Less than 5 years	1	1.08
5-10 years	18	19.35
More than 10 years	74	79.57
	93	100.0
Industry category		
Manufacturing	55	59.14
Trading and services	21	22.58
Construction and property	12	12.90
Others	5	5.38
	93	100.0
Number of employees		
Less than 250	39	41.94
251-500	13	13.98
More than 500	41	44.08
	93	100.0
Annual sales turnover		
Less than RM10 million	28	30.11
RM10 million to RM100 million	38	40.86
More than RM100 million	27	29.03
	93	100.0
Legal structure		
Unincorporated	20	21.51
Incorporated	73	78.49
	93	100.0
Ownership structure		
Local public-listed	42	45.16
Privately owned company	31	33.33
Government-owned/controlled	7	7.53
Foreign-owned	13	13.98
	93	100.0

Table II.
Profiles of respondents and organizations

operational benefits from ERP adoption are improvement in data accuracy, enhancement in data integrity and speeding-up of financial report preparation. For managerial benefits, the three most important perceived benefits are improvement in data and information sharing, provision of timely and relevant information for decision making and improvement in business operation analysis, while those perceived strategic benefits are enabling proactive identification of customers' needs, improved ability to respond to changes in the external environment and facilitating creation of competitive advantage.

The overall mean score for institutional pressures is 3.05, and the mean scores for mimetic pressure, coercive pressure and normative pressure are 3.18, 3.02 and 2.98,

Variable	Mean	SD	Minimum	Maximum
Operational benefits	4.29	0.491	3.00	5.00
Managerial benefits	4.09	0.586	2.83	5.00
Strategic benefits	3.82	0.738	1.75	5.00
Overall economic benefits	4.07	0.554	2.86	5.00
Mimetic pressure	3.18	0.935	1.00	5.00
Coercive pressure	3.02	0.391	2.00	4.33
Normative pressure	2.98	0.842	1.00	5.00
Overall institutional pressures	3.05	0.521	1.55	4.64
ERP adoption extensiveness	2.96	1.100	0.33	5.00
System usage	4.22	0.515	2.57	5.00
User satisfaction	3.99	0.524	2.00	5.00
Financial performance	3.63	0.703	1.00	5.00
Non-financial performance	3.68	0.749	1.00	5.00
Overall organizational performance	3.67	0.712	1.00	5.00

Note: Scale: 1 = very low; 5 = very high

Table III.
Descriptive statistics of variables

respectively. The most important mimetic pressure is the pressure exerted by the extent to which the organization's major competitors have implemented ERP system. For coercive pressure, the most important is the pressure exerted by the extent to which the organization's parent company has implemented the ERP system. The most important normative pressure is the pressure exerted by the extent to which the organization's industry/trade associations or related professional bodies have promoted the use of ERP system.

The ERP applications adopted among the sample firms are not extensive as indicated by the overall mean score of 2.96 for ERP adoption extensiveness. The accounting and finance module (mean score 4.51) is the most extensively implemented module, followed by the inventory management module (mean score 3.75), distribution and logistics module (mean score 3.40), sales and marketing module (mean score 3.37), production planning and control module (mean score 3.28) and human resource management module (mean score 2.4). The levels of adoption of the extended ERP modules such as supply chain management (mean score 2.10), customer relationship management (mean score 1.96) and the business intelligence (mean score 1.91) are fairly low.

The overall mean score for system usage is 4.22, which is higher than the overall mean score of 3.99 for user satisfaction. The ERP system is most extensively used to capture transaction data (mean score 4.47), process data (mean score 4.37) and retrieve work-related data and information (mean score 4.26). It is least used to manage organization's resources (mean score 3.95). With regard to user satisfaction, users are most satisfied with the precise data and accurate information provided by the system (mean score 4.20) and they are least satisfied with the ability of system to automate data collection and analysis (mean score 3.73).

The overall mean score for organization performance is 3.67, with mean score of 3.63 for the financial performance component and mean score of 3.68 for the non-financial performance component.

6.1 Economic and institutional influences on ERP adoption extensiveness

Results of the regression of the economic and the institutional factors on ERP adoption extensiveness are summarized in Table IV. After controlling for organizational size

and industry affiliation, the results indicate that ERP adoption extensiveness is significantly influenced by the economic-based factors ($p = 0.049$) and only marginally influenced by the institutional factors ($p = 0.06$). This study supports *H1* and are consistent with findings of earlier studies (Holsapple and Sena, 2005; Shiau *et al.*, 2009; Kannabiran and Dharmalingam, 2012) that perceived economic benefits have higher significant influences on ERP adoption decision than institutional factors.

Further analysis, however, indicates that none of the three types of economic benefits individually has a significant effect on ERP adoption extensiveness even though each economic benefit is positively associated with ERP adoption extensiveness, as shown in Table V. On the other hand, the mimetic pressure has a significant positive relationship with ERP adoption extensiveness, even though institutional pressure as a whole does not significantly impact ERP adoption extensiveness. The finding suggests that even though the overall economic benefit consideration significantly affects ERP adoption extensiveness, none of the economic benefit types individually is significantly associated with ERP adoption extensiveness. This is possibly because most of the ERP applications improve not only operational efficiency, but also enhance decision making at managerial and startegic levels. On the other hand, ERP adoption extensiveness by the organization is often the consequence of an organization's attempt to stay competitive by mimicking the technological capabilities of its leading competitors. In other words, ERP modules that are visible and impactful in an industry have to be adopted (or mimic) as a competitive necessity, and these modules resemble the "observability" characteristics explained in Roger's (2003) technology diffusion theory. Coercive pressure that is found to exert strong influence on EDI adoption by Iacovou *et al.* (1995) does not significantly influence ERP adoption

Table IV.
Results of the regression of economic and institutional factors on ERP adoption extensiveness

	Standardized β	t	Sig.
Constant	–	−1.161	0.249
Size	0.175	−1.681	0.097
Industry	0.054	0.522	0.603
Economic factors	0.217	2.000	0.049**
Institutional factors	0.207	1.904	0.060*

Notes: $R^2 = 0.143$; Adjusted $R^2 = 0.101$; F-statistic = 3.453, $p = 0.012$. **,*Significant at 0.05 and 0.10 levels, respectively

Table V.
Results of the regression of individual economic benefits and institutional pressures on ERP adoption extensiveness

	Standardized β	t	Sig.
Constant	–	−0.875	0.384
Size	0.150	1.444	0.153
Industry	−0.013	−0.127	0.899
Operational benefits	0.053	0.330	0.742
Managerial benefits	0.116	0.773	0.442
Strategic benefits	0.156	0.989	0.326
Mimetic pressure	0.370	3.274	0.002*
Coercive pressure	−0.217	−1.608	0.112
Normative pressure	0.059	0.482	0.631

Notes: $R^2 = 0.230$; Adjusted $R^2 = 0.152$; F-statistic = 2.942, $p = 0.006$. *Significant at 0.01 level

extensiveness in this study. This is possibly because of the higher inter-organizational dependency needed in an EDI system as compared that necessary in an ERP system. Iacovou *et al.* (1995), however, reported that high-perceived economic benefits are associated with highly integrated EDI systems, and that is consistent with findings of the current study that perceived economic benefits are positively associated with ERP adoption extensiveness. Other studies (Kuan and Chau, 2001; Martin and Matlay, 2001; Scupola, 2003; Dholakia and Kshetri, 2004; Kannabiran and Dharmalingam, 2012) have also revealed that competitive pressure has a significant influence on IT adoption.

6.2 Relationship between ERP adoption extensiveness and organizational performance

Results of the regression of ERP adoption extensiveness on organizational performance, as summarized in Table VI, show that ERP adoption extensiveness is significantly and positively associated with the overall organizational performance ($p = 0.000$), as well as with each of the two performance dimensions (financial and the non-financial). The relationship between ERP adoption extensiveness and the non-financial performance measure is stronger than that between ERP adoption extensiveness and the financial performance measure. *H2*, is supported.

6.3 Mediating effects on the relationship between ERP adoption extensiveness and organizational performance

6.3.1 Mediating effect of system usage. The mediating effect of system usage on the relationship between ERP adoption extensiveness and organizational performance is tested based on Baron and Kenny (1986). The relationship between extensiveness of ERP applications adopted (independent variable) and organizational performance (dependent variable) is highly significant, as indicated in Table VI. Table VII presents results of the three regression models: model 1 represents the regression of ERP adoption extensiveness (independent variable) on system usage (mediating variable); model 2 represents the regression of system usage (mediating variable) on organizational performance (dependant variable); model 3 represents the regression of ERP adoption extensiveness (independent variable) on organizational performance (dependant variable), while controlling system usage (mediating variable). Based on the results of models 1 and 2, and that reported earlier in Table VI, conditions for testing for the mediation effect are met, and the mediator model (model 3) indicates that the effect of ERP adoption extensiveness on performance is no longer significant when system usage is controlled (model 3). The result, hence, indicates that system usage

	Financial performance			Non-financial performance			Overall performance		
	Std. β	t	Sig.	Std. β	t	Sig.	Std. β	t	Sig.
Constant		9.781	0.000		9.497	0.000		9.971	0.000
Size	0.032	0.327	0.745	−0.042	−0.459	0.647	−0.021	−0.231	0.818
Industry	−0.152	−1.552	0.125	−0.151	−1.690	0.095	−0.156	−1.715	0.090
ERP adoption extensiveness	0.414	4.175	0.000*	0.561	6.196	0.000*	0.536	5.812	0.000*
	$R^2 = 0.198$; Adjusted $R^2 = 0.169$; F-statistic = 6.897; $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.330$; Adjusted $R^2 = 0.306$; F-statistic = 13.813, $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.306$; Adjusted $R^2 = 0.282$; F-statistic = 12.363; $p = 0.000$. *Significant at 0.001 level		

Table VI. Results of regression of ERP adoption extensiveness on organizational performance

fully mediates the relationship between ERP adoption extensiveness and organizational performance. *H3* is fully supported.

6.3.2 Mediating effect of user satisfaction. The mediating effect of user satisfaction is similarly tested and the results of the three models are presented in Table VIII. In this case, the mediating model (model 3) shows that user satisfaction only partially mediates the relationship between ERP adoption extensiveness and organizational performance because the effect of ERP adoption extensiveness on organizational performance remains significant, albiet at a lower level of significance, when user satisfaction is controlled. Hence, *H4* is only partially supported.

7. Conclusion and implications

This study examines how decision rationality affects ERP adoption extensiveness and subsequently, the organizational performance. The mediating roles of two system success measures, system usage and user satisfaction, are also investigated. The results indicate that the overall perceived economic benefits of ERP systems, but not the overall institutional pressures, significantly affects ERP adoption extensiveness. Further analyses, however, indicate that only the mimetic pressure significantly affects

Table VII.
Mediating effect of system usage on relationship between ERP adoption extensiveness and organizational performance

	Model 1 (dependent: system usage)			Model 2 (dependent: performance)			Model 3 (dependent: performance)		
	Std. β	t	Sig.	Std. β	t	Sig.	Std. β	t	Sig.
Constant		19.566	0.000		−0.299	0.766		0.435	0.665
Size	0.013	0.163	0.871	−0.015	−0.182	0.856	−0.028	−0.343	0.732
Industry	−0.254	−3.317	0.001*	0.130	0.159	0.874	−0.016	−0.189	0.850
ERP adoption extensiveness	0.670	8.663	0.000*				0.166	1.468	0.146
System usage				0.669	7.880	0.000*	0.552	4.758	0.000*
	$R^2 = 0.511$; Adjusted $R^2 = 0.494$; F-statistic = 29.312; $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.441$; Adjusted $R^2 = 0.421$; F-statistic = 22.070; $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.455$; Adjusted $R^2 = 0.429$; F-statistic = 17.319; $p = 0.000$. *Significant at 0.001 level		

Table VIII.
Mediating effect of user satisfaction on relationship between ERP adoption extensiveness and organizational performance

	Model 1 (dependent: user satisfaction)			Model 2 (dependent: performance)			Model 3 (dependent: performance)		
	Std. β	t	Sig.	Std. β	t	Sig.	Std. β	t	Sig.
Constant		15.791	0.000		2.119	0.037		3.145	0.002
Size	−0.020	−0.211	0.833	0.041	0.420	0.675	−0.017	−0.184	0.855
Industry	−0.155	−1.652	0.102	−0.087	−0.889	0.376	−0.119	−1.323	0.190
ERP adoption extensiveness	0.496	5.229	0.000*				0.418	4.037	0.000**
User Satisfaction				0.444	4.550	0.000*	0.237	2.296	0.024*
	$R^2 = 0.265$; Adjusted $R^2 = 0.239$; F-statistic = 10.119; $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.220$; Adjusted $R^2 = 0.192$; F-statistic = 7.882; $p = 0.000$. *Significant at 0.001 level			$R^2 = 0.348$; Adjusted $R^2 = 0.316$; F-statistic = 11.062; $p = 0.000$. *,**Significant at 0.05 and 0.001 levels, respectively		

ERP adoption extensiveness. Ugrin (2009) similarly reported a significant influence of the mimetic factor on the ERP adoption intent of his sample of primarily small and medium-sized organizations in the USA. ERP adoption extensiveness is also found to have a significant positive impact on organizational performance, with system usage fully mediates and user satisfaction partially mediates the relationship between ERP adoption extensiveness and organizational performance.

This study is different from the earlier studies that examine largely factors influencing the initial ERP adoption decision. The focus of this study is on how economic-based and institution-based factors influence the extensiveness of ERP investments rather than on the initial ERP adoption decision. In this study, it is interesting to note that the extensiveness of investments in enabling technologies, such as the ERP systems, is very much based on economic rationalization rather than on the need for conformity with institutional norms and requirements of external constituents (Meyer and Rowan, 1977). The effects of both the coercive and the normative pressures on the extent of ERP adoption extensiveness are insignificant. The findings indicate that companies emphasize on both the tangible and intangible benefits of ERP when deciding on investments in extended ERP applications in their organizations, and when the benefits of certain complex ERP systems are too uncertain for the traditional cost-benefit analysis, companies tend to mimic the investment decisions of their competitors to stay competitive. This study also shows that extensiveness of ERP applications enhances organizational performance and system usage explains the positive relationship between ERP adoption extensiveness and performance. As the extensiveness of ERP adoption in this study may proxy ERP system complexity and maturity, the findings of this study provide further support for previous findings (Poston and Grabski, 2001; Nicolaou, 2004; Wieder *et al.*, 2006) that organizational performance increased with ERP system complexity and maturity and that ERP system would not positively impact performance unless it is fully utilized (Le Blanc and Kozar, 1990). The earlier mixed findings on the relationship between ERP adoption and organizational performance may be attributable to the inadequate differentiation in the extensiveness or complexity of ERP adoption and differences in the decision rationale for the ERP investments. According to Ugrin (2009), decision rationale to merely legitimize the ERP adoption decision may lead to the "misfit" between the technology adopted and the business operational requirements that cause many failures in ERP adoption.

The findings of this study have a few implications. First, the findings suggest that ERP adoption by organizations in Malaysia is still at the infancy stage, as evidenced by the high emphasis on the ERP benefits at automate (operational) level in the sample firms. This finding suggests that most of the sample firms have yet to fully exploit the potential strategic capabilities of the ERP system for competitive advantage. Supramanian and Kuppusamy (2010) reported that about 50 per cent of the ERP systems in their sample were installed only one year or more ago, and hence, many had yet to reach the complexity level for strategic advantage. Second, the finding of a significant mimetic pressure on ERP adoption extensiveness in this study suggests that many of the sample firms are "followers" of the technology innovations (Tuttle and Dillard, 2007) rather than leaders in technology innovation adoption, and that may inhibit the ability of these organizations to leapfrog to a higher level of performance through innovative use of technology in designing their business processes, products and services.

Lack of awareness of the full potential benefits of the ERP system and the resource availability concern may have hindered effective diffusion of ERP among companies in

Malaysia. Relevant government agencies could play an important role to enhance knowledge, not mere awareness, of the local companies, especially the smaller business enterprises, on how the ERP system may be used as an enabler to create competitive advantage. Measures such as launching effective education and promotion campaigns, providing financial aids and technical training are needed to facilitate meaningful ERP adoption among companies in Malaysia. As the investments in extended ERP applications among companies in Malaysia are still relatively low, vendors of ERP systems in Malaysia should take the opportunity to increase their sales of extended ERP systems by reviewing their current marketing strategies. For example, the success stories of how users of ERP systems gain strategic competitive advantage should be highlighted in their product promotions, and their product offerings may have to be modified to mitigate the resource availability concerns of the smaller business enterprises.

This study has the limitations associated with questionnaire-based research. The small sample size of this study may also limit the generalizability of its findings. For more in-depth understanding of the ERP adoption decision, a case study approach may provide new insights on decision making process on investments in extended ERP applications and its subsequent impact on organizational performance.

Notes

1. Manufacturing sector included industrial products and consumer products manufacturing firms.
2. Trading and services sector included finance and technology services firms.
3. Construction sector included property and infrastructure firms.
4. In Chand *et al.* (2005), automate benefits refer to operational benefits, informate benefits refer to managerial benefits and transformate benefits refer to strategic benefit.

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