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An Empirical Study of Factors Affecting e-Commerce Adoption among Small- and Medium-Sized Enterprises in a Developing Country: Evidence from Malaysia

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The purpose of this paper is to empirically examine determinants of e-commerce adoption among Malaysian small- and medium-sized enterprises (SMEs). This study tested eight hypotheses on determinants affecting e-commerce adoption with empirical data from several survey instruments: an online questionnaire-based survey, mailed survey and questionnaire collected in-person from a sample of 307 SMEs in Malaysia. The findings show that e-commerce adoption within Malaysian SMEs is affected by perceived relative advantage, perceived compatibility, managers/owner's knowledge and expertise, management characteristics and external change agents. This study contributes to enhancing the understanding of the determinants of adopting e-commerce in SMEs and provides some interesting perspective from Malaysia. Those parties interested in promoting their business online may find these results helpful in guiding their efforts.

Keywords: electronic commerce adoption; small- and medium-sized enterprises; Malaysia; developing country

Introduction

The current business environment is getting more competitive. In order for firms to stay competitive in the marketplace domestically and internationally, businesses have always strived to improve themselves by creating better ways to meet their customers' needs (Ahmad, Abdul Rani, & Mohd Kassim, 2010). One of the most significant development trends in the last 10 years is the increased use of the Internet as a medium for conducting business activities and new opportunities for transaction due to its potential benefits to businesses, especially to small- and medium-sized enterprises (SMEs), such as cost reduction, streamlining of business processes, enhancing a firm's market reach, improved operational efficiencies, access to new customers, supplier contacts and trading partners, creation of new ways of selling existing products and greater competitive advantage (Beatty, Shim, & Jones, 2001; Chau, 2003; Daniel, Hoxmeier, White, & Smart, 2004; Lai, 2007; Riemenschneider, Harrison, & Mykytyn, 2003; Standing, Standing, & Love, 2010).

At a very basic level, e-commerce technology can make communication within the firm faster and make the management of the firm's resources more efficient. Seamless transfer of information through shared electronic files and networked computers increases the efficiency of business processes such as documentation, data processing and other back-office functions

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(e.g. organizing incoming orders and preparing invoices). Such benefits can be greater for SMEs than for larger firms; for instance, e-commerce could enable SMEs that remain local because of a lack of information and marketing capability to gain access to new customers and to expand their markets geographically.

Nevertheless, while many studies point to the benefits achieved by SMEs adopting e-commerce, large businesses reaped these benefits as well and can expand into areas in which SMEs dominated. For instance, most SMEs who have adopted e-commerce have not moved beyond the entry-level adoption (Molla & Licker, 2005). Jones, Packham, Beynon-Davies, and Pickernell (2011) argued that worldwide, it has not been easy for SMEs to adopt e-commerce partly due to the continuous change of e-commerce technology and the varying needs of local and global businesses in general. In addition, the cost of acquiring e-commerce infrastructure is high for many SMEs especially in developing economies. Therefore, the gap between SMEs and large firms tends to be greater. Coherently, this may affect SMEs competitiveness and survival in the long run.

Grandon and Pearson (2004) mentioned that so far research investigating on the adoption of e-commerce by SMEs is still small in number and insufficient. The adoption process and the potential of e-commerce within individual SMEs, and as a consequence its diffusion across the SMEs sector as a whole, are still not well understood (Drew, 2003; Qureshi & York, 2008; Santos & Peffers, 1998; Spanos, Prastacos, & Poulymenakou, 2002). Although past studies have attempted to investigate the factors that influence e-commerce adoption, many of these studies are carried out mainly in developed nations. The literature review done on the subject matter showed that there is a lack of empirical evidence to explain the extent of e-commerce adoption among firms in developing countries. Molla and Licker (2005) noted that the understanding of what drives e-commerce among businesses, especially in developing countries, is limited by the absence of rigorous research. Teo and Ranganathan (2004) meanwhile lamented that very limited studies on e-commerce are conducted in the Asia-Pacific region.

E-commerce researchers argued that research findings from one country may not necessarily be applicable to other countries (Dewan & Kraemer, 2000). This is because businesses, in particular SMEs in developing countries, face challenges different from those in developed countries and differs greatly in adopting and benefiting from e-commerce (Tan, Tyler, & Manica, 2007). Therefore, different factors were found to affect its adoption (Kartiwi & MacGregor, 2007) that limit the generalization of research results from various perspectives (Dewan & Kraemer, 2000). Hence, there has been a lack of strong empirical work to enable the establishment of models to find out the factors that can explain the adoption of e-commerce in this part of the region. Although several studies were done in the context of e-commerce adoption in Malaysia (see Adham & Ahmad, 2005; Alam & Mohammad Noor, 2009; Lip-Sam & Hock-Eam, 2011), the studies have not yet reached an in-depth analysis especially concerning the issues of electronic endeavor on the development of SME. Therefore, the purpose of this study is to fill existing research gap by empirically establishing a model to explain the factors influencing the adoption of e-commerce in Malaysia. This is predominantly needed to enhance the understanding of the determinants of e-commerce adoption in a developing country, specifically Malaysia.

With regard to the Malaysian e-commerce landscape, the country is one of the developing countries that have begun to utilize e-commerce in both domestic and international businesses. Malaysia is one of the pioneers among Asian countries to establish a ministry that is related to e-commerce development and to spearhead and promote the growth of Information and Communication Technology (ICT) with the support of several agencies such as Malaysian Communications and Multimedia Commission and Multimedia Development Corporation. These agencies have continued to contribute to e-commerce by developing master plan, infrastructure agendas

and fostering research in what is needed to drive e-commerce in Malaysia further. The government is also pursuing a “knowledge-based economy” agenda to make the country a preferred ICT destination. Evidence of this includes the establishment of National Information Technology Council that functions as the primary advisor and consultant to the Government on matters pertaining to information technology (IT) in Malaysia’s national development.

Despite the effort of the Malaysian government in encouraging the development of ICT, the e-commerce adoption among SMEs remains low (Bernama, 2012). The Small and Medium Industries Association of Malaysia reported that ICT implementation among local SMEs is still at a very basic level (Hussin & Mohamad Noor, 2005). Many Malaysian SMEs are still low in the adoption of e-commerce ladder and they have mainly adopted e-commerce for communication and marketing purposes through the establishment of a corporate website (Ainin, 2000; Ang, Tahar, & Murat, 2003). As a matter of fact, quite a number of SMEs that have company websites are not fully functional. These firms which are reported to have e-commerce capability, in general, are not using e-commerce for a large proportion of their transactions (Ang et al., 2003). In a study by Zakaria and Hashim (2003) revealed that only 15% of the Malaysian SMEs are utilizing the Internet as a tool to expedite their business operations. This is further supported by Alam and Mohammad Noor (2009) who indicated that SMEs in Malaysia is relatively slow in web adoption, where only 20% out of 600,000 SMEs in Malaysia were applying IT in their daily operations.

Having presented the current state of e-commerce adoption in Malaysia, this paper is structured as follows. This section starts by presenting the motivation of the study. Next it discussed the purpose of this paper. The third section argues the theoretical importance of this study which further develops the research framework for the investigation of the research question. The fourth section presents and justifies the research methodology and the data collection process of the study. The final section presents the study results with sections discussing the findings, limitations, future direction, implication and conclusions of the study.

Purpose

The SMEs play a vital role in the Malaysian economy and are considered to be the backbone of industrial development in the country (Ramayah & Koay, 2002; Saleh & Ndubisi, 2006). Tan (2006) argues that ICT in Malaysia is facing big challenges due to the slow adoption of technology by SMEs in Malaysia. Therefore, the Malaysian government has embarked on a major push to persuade SMEs to adopt the Internet as a new and more efficient way of doing business and generating new business. Despite these efforts, however, SMEs in Malaysia remain on the wrong side of a digital divide (Karkoviata, 2001). The Economist Intelligence Unit (2006) reported that although SMEs in Malaysia can apply for soft loan through SME Corporation Malaysia to adopt ICT to improve competitiveness, efficiency and productivity, approximately only 20% of Malaysia’s SMEs have an online presence and use IT extensively in their daily operations. This reflects a poor rate of IT adoption among the estimated 600,000 local SMEs. Therefore, the purpose of this study is to empirically examine the determinants of e-commerce adoption among Malaysian SMEs. This study outlines three general research questions that have guided this research effort:

- (a) What are the factors that affect owners/managers of SMEs in Malaysia in adopting e-commerce?
- (b) Which factors from the technological, organizational and environmental context affect Malaysian SMEs in adopting e-commerce?
- (c) What are the significant factors that can lead to a successful e-commerce adoption among Malaysian SMEs?

The answers to the above questions would contribute to the existing literature by filling the gap declared recently that e-commerce adoption in SMEs, particularly in developing countries, is an emergent area of investigation in which only limited research has been undertaken (Al-Shaikh, Torres, Zúniga, & Ghunaim, 2010; Datta, 2011; Gurau, 2008). Therefore, the present study addresses this gap in the literature and makes theoretical and practical contributions. First, the proposed model leads to a better understanding of the determinants of adoption of technology in a developing economy. Second, prior e-commerce literature has shown that only a small number of studies have focused on the adoption and the use of e-commerce in SMEs (Grandon & Pearson, 2004). Therefore, this study would confirm whether the determinants of e-commerce among SMEs in Malaysia differ with large firms.

Research model and hypothesis of this study

This research drew mainly from the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) and a few are adapted from the literature (Chong & Pervan, 2007; Grandon & Pearson, 2004; Iacovou, Benbasat, & Dexter, 1995; Igbaria, Zinatelli, & Cavaye, 1998; Premkumar & Roberts, 1999), which other e-commerce and information systems researchers (Al-Qirim, 2007; Chong, Ooi, Lin, & Tang, 2009; Chwelos, Benbasat, & Dexter, 2001; Gibbs & Kraemer, 2004; Iacovou et al., 1995; Kuan & Chau, 2001; Li et al., 2010; Raymond, 2001; Scupola, 2003) have used in comparable studies and is widely accepted among researchers in the social science. TOE framework is consistent with Rogers' (2003) diffusion of innovation theory as it focuses on both internal and external characteristics of the organization, as well as technological characteristics in the study of drivers for new technology diffusion.

The model identifies three aspects of firm's characteristics that influence the process of adopting, implementing and using technological innovations (DePietro, Wiarda, & Fleischer, 1990; Robertson, 2005; Tornatzky & Fleischer, 1990) which is explained as follows:

- (a) *Technological context* – describes both existing and new technologies relevant to the firm such as prior technology usage and number of computers in the firm which determines the ability of the firm to move to e-commerce and other technology initiatives.
- (b) *Organizational context* – refers to descriptive measures related to organizations such as firm scope, firm size and managerial beliefs.
- (c) *Environmental context* – focuses on areas which the firm conducts its business operations, with the priority given to external factors influencing the industry that have significant impacts on the firm such as government incentives and regulations.

By drawing on the above model and recent technology adoption literature, an integrated model of e-commerce adoption in Malaysian SMEs is proposed. The theoretical framework combines the TOE model and adds other likely explanatory factors (Figure 1). The framework of this study consists of eight independent variables, all of which are postulated to affect the same dependent variable, e-commerce adoption in Malaysian SMEs. This research model relates the independent and dependent variables without any intervening variables. Each of the variables is discussed below.

Technological context

(a) *Perceived relative advantage*: Perceived relative advantage (or perceived benefits) is the belief that certain benefits will be obtained by performing the behavior. Perceived relative advantage is one of the most frequently used characteristics in the e-commerce adoption

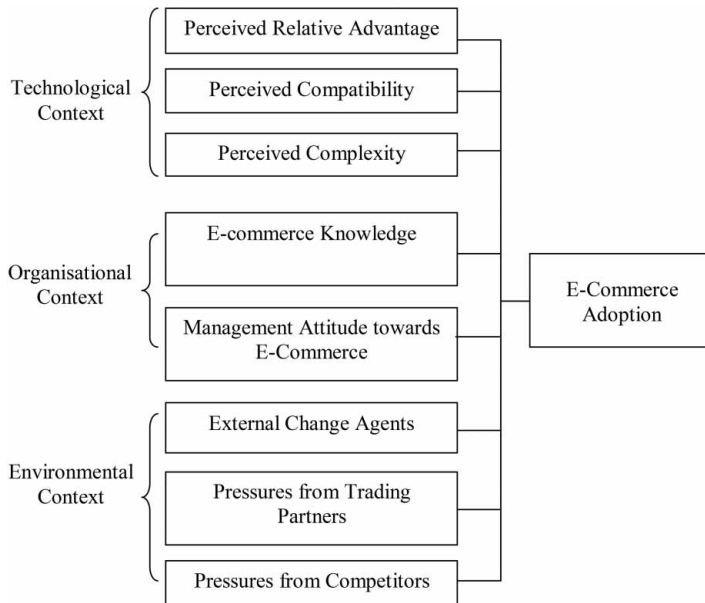


Figure 1. Research model of this study.

studies (Kuan & Chau, 2001; Seyal, Awais, Shamail, & Abbas, 2004). Most past studies have illustrated that perceived relative advantage is an important determinant of technology adoption (Al-Qirim, 2007; Kaynak, Tatoglu, & Kula, 2005). Many past studies have advocated that the use of e-commerce positively influences an organization's performance, specifically in terms of growth (Qureshi, Keen, & Kamal, 2010; Raymond, Bergeron, & Blili, 2005), financial gain (Johnston, Wade, & McClean, 2007) and competitive advantage (Teo, 2007). However, this study is more interested in how the SMEs perceive those benefits. Examples of benefits typically associated with e-commerce adoption are: increase of revenues and profits, reduction in costs, improvement in customer service, development of new market segments and the stream-line of business operations. Therefore, hypothesis one reflects the relationship described:

H1: The perceived relative advantage is positively related to adoption of e-commerce by Malaysian SMEs.

(b) *Perceived compatibility*: In this study, perceived compatibility refers to how well e-commerce fits with the current business processes as well as the suppliers and customers. According to Grandon and Pearson (2004), compatibility between e-commerce and firm's culture and values and preferred work practices is an important factor in determining adoption. Several prior researches on e-commerce adoption within SMEs found that e-commerce adoption and usage is significantly affected by e-commerce compatibility (Hong & Zhu, 2006; Saffu, Walker, & Hinson, 2008). Consequently, the lack of organizational compatibility may impose constraints on the level of e-commerce used (Gibbs & Kraemer, 2004). Thus, hypothesis two is:

H2: Malaysian SMEs with greater perceived compatibility is positively related to adoption of e-commerce.

(c) *Perceived complexity*: Perceived complexity is defined as the degree to which a firm perceives the adoption of e-commerce would be complicated. Many studies have found significant relationship between complexity and e-commerce adoption (Huy & Filiatrault, 2006; Jeon, Han, & Lee, 2006). SMEs might perceive e-commerce as something which is complex and

not applicable to their current level of business. This is not surprising because SMEs lack of skills among its workforce to use ICT (Spectrum, 1997). In addition, SMEs are known to have a low level of managerial and technical skills. Therefore, they might perceive the implementation of e-commerce as very challenging (Hussin, King, & Cragg, 2002). Hence, hypothesis three was derived:

H3: Perceived complexity is negatively related to adoption of e-commerce by Malaysian SMEs.

Organizational context

(a) *E-commerce knowledge*: Many studies have documented how the level of e-commerce knowledge within an organization can affect its adoption. For example, Mehrtens, Cragg, and Mills (2001) highlighted that the knowledge among non-IT professionals is a very significant factor in Internet adoption. Teo and Ranganathan (2004) also discovered that 54.4% of e-commerce adopters in Singapore had a formal plan and a task force dedicated to carry out e-commerce initiatives, indicating the prevalence of internal expertise within such organizations. Knowledge is most influential only at the earlier stage of adoption and become less important when e-commerce moves toward the higher end of adoption ladder (Roberts & Toleman, 2007). In the context of Malaysia, among the major barriers to e-commerce adoption in Malaysia are: not having e-commerce knowledge, lack of e-commerce skills and lack of skilled workers to operate e-commerce (Sulaiman & Jaafar, 2003). Therefore, hypothesis four is derived:

H4: The e-commerce knowledge is positively related to adoption of e-commerce by Malaysian SMEs.

(b) *Management attitude toward e-commerce*: According to Saffu et al. (2008), top management's enthusiasm to adopt IT is one of the factors that contribute toward adopting of e-commerce. It can be expected that companies that have positive management attitude toward e-commerce have more tendency to initiate e-commerce activities. Mirchandani and Motwani (2001) argued that the support from top management is essential and can be clearly differentiated between the adopters and non-adopters of e-commerce. When top managers in any organization understand the relevance of a specific technology like e-commerce, they tend to play a crucial role in influencing other organizational members to accept it; furthermore, they also commit resources to its adoption (Premkumar & Roberts, 1999). Therefore, the success of e-commerce deployment depends on the support by the management. Hypothesis five is postulated to reflect this relationship:

H5: The management in Malaysian SMEs attitude toward e-commerce is positively related to adoption of e-commerce

Environmental context

(a) *External change agents*: A number of studies have investigated the availability of external skilled labor and software/hardware vendors as a determinant of e-commerce adoption among SMEs (Doolin, McLeod, McQueen, & Watton, 2003; Srinivasan, Lilien, & Rangaswamy, 2002). Kuan and Chau (2001) noted that among the driving force for SMEs to adopt a technology comes from the government policies. Through direct interventions, governments have a considerable impact on the level of Internet penetration and usage. For example, Ang et al. (2003) explained that within the Malaysian shipping industry, the Electronic Data Interchange usage is high because shippers and forwarders are forced to transact with Customs Department electronically, for duty payments and import/export declarations. Apart from that, the current e-government system requires that any company that wishes to procure or participate in

government contracts adopt the system. The external change agents that might influence e-commerce adoption include the organization advisors, the government, external consultants and also e-commerce solution providers. This lead to hypothesis six:

H6: The adoption of e-commerce among Malaysian SME is positively related to external change agents.

(b) *Pressures from trading partners*: The success of the Internet initiatives of an organization depends not only on its own effort, but also on the readiness of its customers, suppliers and trading partners to engage in electronic interactions and transactions (Barua, Whinston, & Yin, 2000a, 2000b). Keeling, Vassilopoulou, McGoldrick, and Macaulay (2000) and Shih (2008) investigated the factors driving and inhibiting e-commerce adoption in SMEs. They found that adoption was motivated by pressure from customers. A firm may adopt a technology due to the influences exerted by its trading partners (Kuan & Chau, 2001). This is because a company may feel pressure to adopt the technology if its business partners request or recommend it to do so. Multinational corporations, in the past, have created coercive pressures on their subsidiaries and suppliers by requiring them to use e-commerce technologies to link to global production networks (Gibbs & Kraemer, 2004). Dholakia and Kshetri (2004) argued that SMEs in developing countries are adopting e-commerce due to high pressure from their suppliers and customers. Therefore, SMEs might also face the same pressure, especially when dealing with the relatively bigger companies and partners. Hence, hypothesis seven reflects the relationship postulated:

H7: The adoption of e-commerce among Malaysian SMEs is positively related to pressure from trading partners

(c) *Pressures from competitors*: Relationships among players within the same industry also affect the overall industry structure (Gregor & Johnston, 2000). These relationships determine the extent of competition and rivalry within the industry and play a role in e-commerce adoption. A company may feel pressure when it sees more and more companies in the industry are adopting e-commerce and therefore feels the need to adopt it as well, in order to remain competitive (Kuan & Chau, 2001). Chong et al. (2009) elaborated this when they argued that a company decision to adopt e-commerce technologies might be forced by the competitive pressure and the anticipation of the market trends. Moreover, power structure within the industry is also crucial in technology adoption. Al-Zougool and Kurnia (2008) claimed that if there are dominant players in the industry who enjoy a lot of power, they can force other weaker entities to follow suit in order to create industry standard – or compatibility. Similarly, if the industry is monopolised by a monopoly, duopoly or oligopoly, any technology initiative by one player will then be closely matched and emulated by the rest. However, only few studies have explored how this factor affects the adoption of e-commerce (Wymer & Regan, 2005; Zhu, Kraemer, & Xu, 2003). Therefore, the last hypothesis in this study reflects this scenario:

H8: Positive pressure from competitors favors SMEs in Malaysia adoption of e-commerce.

E-Commerce adoption

E-commerce has been defined in several ways depending on the context and research objective of the author (Grandon & Pearson, 2004). At a general level, e-commerce in SMEs is generally defined as the utilization of ICT and applications to support business activities (Poon & Swatman, 1999). Laudon and Traver (2003) elaborated the definition where they refer e-commerce as a set of technology that is utilized to support online business transactions between the organizations and their direct end customers and between the organizations and others

within their business network(s). Meanwhile, Turban, King, Lee, Liang, and Turban (2010) provided a more specific definition where they stated that “e-commerce is the process of buying, selling, transferring, or exchanging products, services and/or information using computer networks mostly the Internet and Intranets.” In this research, the dependent variable of e-commerce adoption is adapted from the definition of Turban and colleagues (2010) where e-commerce comprises of exchanges of information to the customers and suppliers, leading toward the process of selling and making the transaction through online networks.

One of the major criticisms of previous studies on e-commerce is that e-commerce adoption in firms is mainly viewed as a dichotomous outcome (either adopted or not adopted). The adoption vs. non-adoption approach does not fully address the issue of technology adoption (Daniel & Wilson, 2002; Hovav, Patnayakuni, & Schuff, 2004) in addition to the limitations of statistical analysis for data analysis. Therefore, for the purpose of this analysis, a Likert scale answer response was asked toward the “stages” of e-commerce adoption, which includes information and communication, interactive to communicate and make sales and finally conducted online purchases. This stage of e-commerce represents the e-commerce ability starting from the basic ability of “publishing” details of the company information toward “interacting” with the organizations personnel, customers and suppliers to finally “transacting” with the customers and suppliers where the buying and selling are conducted online.

Research methodology

Data collection

The main focus of the empirical study was SMEs in the Klang Valley area in Malaysia. The logic behind for choosing firms within this area is because the area is the main business center in the country and it is on the advantageous edge as it is equipped with modern facilities, such as fast Internet connections and advanced telecommunications system, compared to other area or states in Malaysia (Siwar & Kasim, 1997). Klang Valley is perceived as a modern model business center in the country and therefore, many large corporations including SMEs established their business presence in that area. A list of SMEs was obtained from SME Corporation Malaysia, a specialized government agency that was established in 2009 to spur the development of SMEs in the country. SME Corporation Malaysia also acted as the central point of reference for information and advisory services for all SMEs in Malaysia.

In order to ensure the pertinence and relevance of the information derived from the data collection, three criteria were set for inclusion in the sample as follows:

- (a) firms must be SMEs, (less than 150 full-time employees for manufacturing sector and less than 50 full-time employees for services sector), as typified by SME Corporation Malaysia classification (<http://www.smecorp.gov.my/v4/node/14>);
- (b) the annual sales turnover less than RM 25 million for manufacturing sector and less than RM 5 million a year for the services sector represent a definition of what constitutes a small to medium scale in the country in terms of the annual sales turnover and
- (c) the sample was drawn from manufacturing and services industries. The purpose in doing so was to improve the external validity of the results compared with some previous studies on the subject that tended to be industry-specific.

An invitation email with the survey URL was sent to 500 email addresses, but 31 of the email addresses turned out to be invalid. The remaining 469 recipients yielded 185 responses which is equivalent to 39.4%. The ease of completing the questionnaire using html-based format may have contributed toward the relatively high response rate. Since the online survey cannot be submitted if there are still unanswered questions, all of the 185 responses received were complete.

However after further examination, two responses were excluded from the study since their companies are no longer defined as SME where they have exceeded the number of employees and the yearly revenues.

On the other hand, although the survey was also posted to 200 addresses via mail, only 31 responses were received from the invited respondents. The low response rate (15.5%) is perhaps due to invalid addresses. There is also the possibility of undelivered or unopened mails. The low response rates could also be explained by the growing trend that people are reluctant to response to random questionnaire survey in addition that it is troublesome to return the answered survey via post (Bryman, 1989). Approximately three weeks after the initial mailing, the researchers personally contacted selected respondents over telephone to request their participation in the survey. In this process, 93 respondents agreed to be interviewed personally. The questionnaire was “coded” to ensure that there was no redundancy on the same respondents answering the questionnaire both through the email and post.

The final usable responses comprise of 183 respondents obtained through online, 31 were collected through mail (post), while 93 responses were collected in-person. Therefore, the total number of useable responses is 307, as shown in the summary below (Table 1). The overall response rate obtained in this study is relatively higher compared to similar studies conducted on SMEs e-commerce adoption in Malaysia (Alam & Mohammad Noor, 2009; Hussin & Mohamad Noor, 2005; Lip-Sam & Hock-Eam, 2011).

In order to assess whether there are any differences between the three samples, *t*-tests were conducted using key variables such as the number of employees, yearly revenue and e-commerce adoption levels. It was found that there is no significant difference between the three samples and so they were all combined to make a single sample, which comprises 307 respondents.

Brief profile of the respondents and companies is given in Table 2. The majority of the surveyed companies are service sectors (66.8%), while 34.2% are from manufacturing sectors. The characteristics of the sample represent the characteristics of the population of the SMEs within the Klang Valley. Out of all the SMEs that were involved in the survey, 13.4% are in the manufacturing sector with 51–150 employees, 11.7% are with 5–50 employees and only 9.1% are with 1–4 employees. Of all the SMEs, 33.2% of them are in the services sector with 20–50 employees. The rest are equally divided (15.6% each) into the 1–4 employees group and the 5–19 employees group. In term of yearly revenues, most of the manufacturing SMEs are earning a yearly revenues in the range from RM250,000 to less than RM10 million (13.4%). On the other hand, most of the SMEs in the services sector have yearly revenues between RM1 million and less than RM 5 million (28.0%). Only 9.4% of the companies have revenues more than RM10 million per year.

Measuring instrument

The questionnaire was designed based on past researches on e-commerce (Lewis & Cockrill, 2002). The questionnaire is divided into four sections: Section A: Demographic Profile;

Table 1. Survey collection method for this study.

Data collection method	Respondents targeted	Response	Response rate (%)	Useable response
Email	500 (469 valid)	185	39.4	183
Post mail	200	31	15.5	31
In person		93	100	93
Total usable responses				307

Table 2. Demographic profile and descriptive statistics of the companies.

Characteristics	Frequency	Percentage
<i>Gender</i>		
Male	111	36.2
Female	196	63.8
<i>Age of respondent's</i>		
21–30 years old	74	24.1
31–40 years old	130	42.3
41–50 years old	73	23.8
>50 years old	30	9.8
<i>Educational level</i>		
Secondary or lower	13	4.2
Diploma/certificate	51	16.6
Bachelor degree/professional	183	59.6
Postgraduate degree	60	19.5
<i>Respondent's current position</i>		
Executive	83	27.0
Manager	88	28.7
Senior manager	42	13.7
Top manager/director/owner	94	30.6
<i>Type of industry</i>		
Manufacturing	105	34.2
Services	202	65.8
<i>Total number of employees</i>		
Manufacturing		
1–4 employees	28	9.1
5–50 employees	36	11.7
51–150 employees	41	13.4
Services		
1–4 employees	48	15.6
5–19 employees	48	15.6
20–50 employees	102	33.2
<i>Yearly revenue</i>		
Manufacturing		
< RM250,000	35	11.4
RM250,000–less than RM10 million	41	13.4
RM10 million–less than RM25 million	29	9.4
Services		
<RM200,000	63	20.5
RM200,000–less than RM 1 million	52	16.9
RM1 million–less than RM5 million	86	28.0

Note: US\$1 is equivalent to RM3.21

Section B: Organization Profile; Section C: e-commerce Adoption; and Section D: e-commerce Adoption Factors. Before the commission of the survey, a pilot test of the structured questionnaire was conducted, involving several respondents. The questionnaire was assessed in terms of ease of understanding, logical consistencies, sequence of the items and contextual relevance. A total of 26 respondents from various SMEs participated in the initial pilot test. Personal visits were made to managers of selected SMEs and they were requested to participate in the survey. Cooper and Schindler (2003) stated that the pilot test group size may range from 25 to 100 respondents and do not have to be statistically selected. The responses were obtained on a seven-point Likert scale, (7 = strongly agree and 1 = strongly disagree). Based on the initial pilot study to determine the key informant of the company, it was found that the managers

in charge of operations, IT or marketing were the most appropriate to answer questions regarding their company adoption of e-commerce. Although “traditionally,” the human resource department would normally be assigned to answer questions from researchers (academic) toward their company, our pilot study showed that they are not “knowledgeable” of the subject matter.

Reliability and validity

In Table 3, 31 items that make up the 8 constructs were tested for their reliability. As all the constructs were entirely taken from past studies, the reliability scores are consistently high in all dimensions. For the constructs within the technological context, the Cronbach’s alpha for perceived relative advantage is .959, for perceived compatibility is .961 and for perceived complexity is .933. As for the organizational context, the Cronbach’s alpha coefficient for e-commerce knowledge and expertise is .927, while for management attitude toward e-commerce is .955. Finally, for environmental context items, the Cronbach’s alpha coefficient for external change agents is .858, for pressure from trading partners is .845 and for pressure from competitors is .912. Finally, the Cronbach’s alpha coefficient for the dependent variable e-commerce is .925. Nunnally (1978) suggested that the minimum acceptable alpha for scale reliability is .70. A closer look at the item per item score also shows that none of the items is “weak” or is suggested for deletion. Therefore, all of the Cronbach’s alpha scores for the constructs in the survey are well above the acceptable point and are reliable. Finally, the multicollinearity of the measurement items was examined through the variance inflation factor in the model. Based on the threshold values recommended by Hair, Anderson, Tatham, and Black (2006), there was no issue of multicollinearity detected.

Results

Data analysis

As given in Table 4, the results of each hypothesis that were being tested in the study are presented. A multiple regression analysis was done using SPSS version 19. The model explained 67.8% of the variance in SMEs’ adoption of e-commerce (66% when adjusted for the population). Highly significant *F*-value indicates very good model fit ($F = 78.313, p < .001$).

As given in Table 5, five of the eight adoption factors – perceived relative advantage, perceived compatibility, e-commerce knowledge, management attitudes toward e-commerce and

Table 3. Reliability analysis of research variables.

Variables	No. of measures	Cronbach’s alpha (α)	Mean	SD
Technological context				
(a) Perceived relative advantage	5	.959	5.380	.553
(b) Perceived compatibility	4	.961	5.475	.492
(c) Perceived complexity	4	.933	3.250	.897
Organizational context				
(a) E-commerce knowledge and expertise	4	.927	5.125	.637
(b) Management attitude toward e-commerce	4	.955	5.225	.530
Environment context				
(a) External change agents	4	.858	5.725	.351
(b) Pressure from trading partners	3	.845	3.900	.737
(c) Pressure from competitors	3	.912	4.300	.457
E-commerce adoption	6	.925	4.950	.441

Table 4. Regression analysis of variance.

Model	Sum of squares	Df	Mean square	F value	Sig.
Regression	627.133	8	78.392	78.313	.000 ($p < .001$)
Residual	298.297	298	1.001		

Table 5. Regression result for each hypothesis.

No	Hypotheses	Standardized Coefficient (β)	t-Value	Sig.	Supported
<i>Technological context</i>					
H1	Perceived relative advantage	.193	2.579	.010 ($p < .05$)	Supported
H2	Perceived compatibility	.210	2.542	.012 ($p < .05$)	Supported
H3	Perceived complexity	-.063	-1.559	.12 ($p > .05$)	Not supported
<i>Organizational context</i>					
H4	E-Commerce knowledge	.171	2.865	.004 ($p < .05$)	Supported
H5	Management attitude toward e-commerce	.194	2.931	.004 ($p < .05$)	Supported
<i>Environmental context</i>					
H6	External change agents	.216	4.153	.000 ($p < .05$)	Supported
H7	Pressure from trading partners	-.031	-0.703	.482 ($p > .05$)	Not supported
H8	Pressure from competitors	-.071	-1.565	.119 ($p > .05$)	Not supported

Notes: Std. error of estimate = 1.00050. $R^2 = .678$. Adjusted $R^2 = .669$.

external change – were found to be significant in predicting SMEs' intention to adopt e-commerce. The findings are discussed in the following section.

Discussion

As mentioned in the introduction section, the purpose of this study is to empirically investigate the determinants of e-commerce adoption among Malaysian SMEs. As explained earlier, perceive relative advantage, perceived compatibility, owner's/managers' e-commerce knowledge, management attitude toward e-commerce and external change agent were found to be statistically significant in predicting SMEs intention to use e-commerce. Of all the factors, the two most significant factors are: external change agent ($\beta = .216$) and perceived compatibility ($\beta = .210$). External change agents among SMEs play a big role in determining e-commerce adoption. This finding is consistent with past studies (Chwelos et al., 2001; Iacovou et al., 1995) that discovered external pressures, including from the government, were significant determinants of e-commerce adoption. External change agents, such as the government, advisors, external consultants and e-commerce solution providers, play a vital role in determining SMEs adoption of e-commerce. In this study, the Malaysian government was instrumental toward SMEs adoption of e-commerce technology by giving various incentives and assistance to these companies through the various agencies setup by the government.

Perceived compatibility of the SMEs toward e-commerce was also found to be a strong factor in e-commerce adoption. According to Beatty et al. (2001), the existing infrastructure is important to the firm's adoption decision. The adoption may fail if the existing infrastructure does not match to the e-commerce technology. This is expected since if the technology is not compatible with the SMEs, the adoption cannot be implemented successfully or would not be

initiated at all in the first place. This is supported by Alam and Mohammad Noor (2009) where in their study showed that the technical compatibility affected positively the adoption of e-commerce among SMEs in Malaysia. Similarly, Grandon and Pearson (2004) discovered that the technical compatibility has a positive effect on e-commerce adoption. In addition, past research also showed that the organization's culture, values and preferred work practices were also correlated with e-commerce adoption (Grandon & Pearson, 2003). Finally, Saffu et al. (2008) concluded that SMEs that wish to adopt e-commerce in their organizations must ensure that there is an alignment between the culture in the organizations and the infrastructure and e-commerce.

Apart from the two significant factors above, perceived relative advantage ($\beta = .194$) and management attitude toward e-commerce ($\beta = .193$) are also found to be significant in determining e-commerce adoption among SMEs. Davis, Bagozzi, and Warshaw (1989) found perceived relative advantage underpinned SME intention to adopt e-commerce. Similarly, Grandon and Pearson (2003) found perceived usefulness to be a significant factor toward e-commerce adoption among SMEs. Managers will only adopt e-commerce if they can see the potential relative advantage that they can gain from it. It is safe to assume that only adopters can find e-commerce advantageous, while non-adopters may find it non-advantageous for their organization. Since the focus of this study was more toward Business-to-Consumer, it is expected that pressure from trading partners is not one of the significant factors adopting e-commerce. Unlike larger companies, SMEs are not typically involved in Business-to-Business activities and therefore do not have many trading partners such as distributors or other intermediaries. Even if they do, they are not as dependent on the partners, as much as larger companies are. This might explain why the pressure from such partners is not significant for Malaysian SMEs in incorporating e-commerce.

Of the three contexts (namely, technological, organizational and environmental) involved in this study, only the organizational context had all of its factors to be significant in contributing toward e-commerce adoption in this study. In the past, the results of organizational context such as organizational readiness were varied. For instance, readiness was not significant in the USA (Grandon & Pearson, 2004), but was significant in Ghana (Saffu et al., 2008). Saffu et al. (2008) argued that this inconsistency may be explained by the difference in the availability of resources at the firm level.

Limitations and future directions

Our results should be interpreted in light of the study's limitations. This study used the term "SME" based on the definition by Malaysian SME Corporation, which qualifies a firm as SMEs based on the total number of employees and yearly revenue (in Malaysia Ringgit). This definition is different from the ones used by other studies, especially in other countries, rendering comparisons with other studies difficult. Besides, the data in this study were gathered from a single region in Malaysia which is the Klang Valley area. This may limit the ability to generalize the results of the study to all SMEs in the country. This study should be extended to cover more SMEs at the national level. Further research should test the research model on SMEs from the whole of Malaysia, as opposed to only from the Klang Valley area. Likewise, the regression analysis has a limitation of testing the possibility of a hierarchical relationship of the independent variables. Therefore, future studies should consider using the confirmatory factor analysis and extrapolate the relationship through path model. Finally, the same population of SMEs, or others, at different industry section, country, and times in the future can be examined to enhance the understanding of e-commerce adoption among SMEs. A replication done in a developing country would provide data for comparison. This would provide insights into the way of using the web in these countries.

Implications

The findings of this research have several implications. To start with, SMEs decision to adopt e-commerce is greatly influenced by external change agents. Therefore, to encourage higher level of e-commerce adoption among SMEs in Malaysia, the government needs to continue to provide support such as financing, training, technical advice and other form of assistance to SMEs that generally lack the required resources. However, the efforts would not be fruitful if no effort is made to improve the ICT skills of business owners as the study shown that the SMEs are “too” dependent on the government assistance. Therefore, efforts to improve technology accumulation through education, experience and skills development should also be focused.

Meanwhile, one of the fears of adopting new technology is the “disruption” that it brings to the firm operations. Therefore, technology providers need to reassure SMEs that e-commerce could integrate with their existing practices and could be carryout in stages. The study also highlights the importance of the CEOs/managers’ attitude toward e-commerce. To elaborate, SMEs with CEOs who perceive that e-commerce could offer many benefits are more likely to adopt e-commerce. Hence, more intervention efforts need to be done to highlight the “observable” benefits of adopting e-commerce. This implies that to encourage higher adoption, more seminars and workshops for CEOs should be intensified. Identification of an industry “role model” could also helps to encourage benchmarking and at the same time publicized the success stories.

Conclusion

This paper builds upon prior adoption research but is different in importance in a way that it analyzes factors that may influence the adoption of e-commerce by Malaysian SMEs. For this purpose, a sample of 307 SMEs in the Klang Valley was investigated. The research was done based on the TOE framework (Tornatzky & Fleischer, 1990) that was developed based on previous studies. Eight distinct factors that were driving adoption of e-commerce were identified through the use of multiple regression analysis. The finding shows that perceived relative advantage, perceive compatibility, e-commerce knowledge, management attitudes toward e-commerce and external change agents are statistically significant elements of e-commerce adoption. On the other hand, perceived complexity and pressure from trading partner and competitors did not seem to influence the adoption of e-commerce. This implies that organizational readiness may strongly influences e-commerce adoption among Malaysian SMEs. However, more research is necessary to evaluate the outcomes of these decisions. It would be particularly interesting to see whether firms viewed these strategic actions as an opportunity or a necessity and to what extent the outcome differed based on the framework of the adoption decision.

This study contributes to the growing body of knowledge for both entrepreneurship and e-commerce in several ways. First, this study contributes to and extends the understanding of the Internet as a medium for commercial use in the marketplace and identifying the rationales for adopting or rejecting the Internet-based e-commerce by the SMEs. Second, the paper examines the factors contributing to e-commerce adoption and is unique in the research to date. Finally, most of the previous research on e-commerce adoption has been done in mostly developed countries in the West although recently high entrepreneurial activities are found in the Asian developing countries. One of the distinctive new aspects of the study of e-commerce adoption in developing counties such as Malaysia is that it can fulfill a knowledge gap and could advance knowledge of e-commerce adoption and strategic value of e-commerce in SMEs and contribute to a better understanding of the e-commerce practices in developing country, particularly in Malaysia. In general, the study provides more understanding of owner’s/managers’ of SMEs perceptions about e-commerce adoption in their businesses. Those interested in promoting the e-commerce may find these results helpful in guiding their efforts.

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