

AN EMPIRICAL STUDY OF FACTORS AFFECTING ELECTRONIC COMMERCE ADOPTION AMONG SMEs IN MALAYSIA

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Abstract. This study empirically examines determinants of E-commerce adoption by Malaysian Small and Medium-sized Enterprises. Research model for this study was drawn on the literature on information and communication technology, Information system, and electronic data interchange. This study tested seven hypotheses on factors that influence e-commerce adoption with empirical data from a sample of 200 SMEs in Malaysia. The findings show that relative advantage, compatibility, organizational readiness, manager's characteristics, and security have significant impact on e-commerce adoption. The study provides a clear understanding of manager's perception about e-commerce adoption in their businesses. This study is important in a global context, as SMEs in Malaysia are going for exporting their product in the global marketplace.

Keywords: e-commerce, SMEs, Relative advantage, Malaysia.

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1. Introduction

Most of the recent researches in Malaysia on electronic commerce (EC) have focused on the Business-to-Consumer segment of e-commerce activity (Khairul and Ahmad 2005; Khatibi *et al.* 2003; Jawahita 2004). This is understandable because the household Internet penetration rate has increased significantly in recent years. A recent statistics shows that the average growth rate of internet penetration in the country between 2000 and 2009 was 356.8 percent per year (Internetworldstats.com 2010) and in 2009 total Internet users were 65.7 percent that contributed to a total 16,902,600 Internet users. However, greater potential in business e-commerce have encouraged companies to move

from traditional method to the online business worldwide. Thompson and Ranganathan (2004) argued that companies have much greater incentive to adopt e-commerce than consumers because it offered many benefits to companies such as massive cost saving in transaction costs, improved efficiency and strategic flexibility by developing more dynamic and flexible relationships with key business partners.

E-commerce researchers reported tremendous growth in e-commerce all over the globe due to the enormous volume of goods and services traded between firms (Laudon and Traver 2001; Garicano and Kaplan 2001). IDC reported that worldwide, more than 624 million Internet users expected to make online purchases in 2009, totaling nearly \$8 trillion (both business to business and business to consumer). By 2013, worldwide e-commerce transactions will be worth more than \$16 trillion (IDC 2010).

Due to the global reach of e-commerce, Small and Medium-sized Enterprises (SMEs) in the developed countries have started adopting e-commerce in their businesses (Rao and Metts 2003); but SMEs in Malaysian and many other developing countries are still reluctant to use information technology or e-commerce in their day-to-day business operation. According to Statistics of SMI (Small and Medium Scale Industries) Association of Malaysia, only 30 per cent of the SMEs in Malaysia have a web presence and use IT on a daily basis (Hussin and Noor 2005). Therefore, it is thus important to identify the factors that influence e-commerce adoption among SMEs in Malaysia. In addition, understanding factors affecting e-commerce adoption help managers of SMEs to predict e-commerce usage rate and evaluate the future growth of e-commerce. Most researche have been concentrated on the e-commerce adoption in the world. However, there is still a need for closer examination on the e-commerce adoption rate in specific countries. Still there is a big research gap exists, especially between the developed and developing countries, which may differ significantly between countries (Licker and Motts 2000; Spanos *et al.* 2002) that limit the generalization of research results from developed countries to developing country contexts (Dewan and Kraemer 2000). According to Shore (1998) and Stiglitz (1998) implementation of information system depend on specific social, cultural, economic, legal and political context, which may differ significantly from one country to another country. Dewan and Kraemer (2000) argued in their study that findings from developed countries were not directly transferable to developing countries. Thus, this research is needed for non-transferability of findings from research in developed countries and also for the improvement of understanding of the determinants of e-commerce adoption in developing countries.

The rest of the paper is organized as follows: firstly identify the relationship between some important factors and intent to adopt e-commerce and secondly, analysis the factors that influence intent to adopt e-commerce among SMEs in Malaysia.

2. Problem statement and objective

According to the speech in the Wall Street Journal by Jerry Jasinowski, President of the US National Association of Manufacturers warned his fellow members by saying “small firms need to get in the e-commerce game or they are going to be shut out of a critical part of the marketplace” (Lomerson *et al.* 2004). This might have encouraged some

SMEs in the USA and other developed nations but the rate of e-commerce adoption in developing nation is rather slow. While there have been some empirical studies on e-commerce adoption in the developed country like Canada and Australia (MacGregor and Vrazalic 2004; Sparling and Toleman 2007), similar attempts on e-commerce adoption have been more limited, particularly the developing country like Malaysia. Despite wide media coverage of the potential growth of e-commerce in the Asia Pacific region, little research so far examined its adoption in businesses, and the factors influencing the adoption intention (Wirtz and Kam 2001). Looking at the current scenario, the purpose of this study is to examine the major determinants of e-commerce adoption by SMEs in Malaysia. The broad research question is: What factors determine the likelihood of adoption of e-commerce in Malaysian SMEs? The research question is concerned with understanding the factors that encourage or discourage SMEs' adoption of e-commerce.

Information systems implementation depends on specific social, cultural, economic, legal and political contexts, which may differ significantly between countries (Spanos *et al.* 2002) that limit the generalization of research results from developed countries to developing country contexts (Dewan and Kraemer 2000). This justifies an empirical investigation of Malaysian SME managers' awareness, perception and organizational readiness or concerns about their current and potential use of e-commerce to uncover the factors that encourage or deter e-commerce adoption. Moreover, this will contribute to confirm past findings of a limited research attempts in developing country context (Molla and Licker 2005a, 2005b) and possible generalization on the adoption of e-commerce (Spanos *et al.* 2002).

3. The Conceptual Framework for this study

It is argued that diffusion of innovation is relevant to the study of Electronic commerce, and that e-commerce has unique features suggesting that e-commerce needs its own specific study (Chong 2006). E-commerce has technical components, similar to other IT innovations, but it also has interorganisational elements which distinguish it from other types of innovations. Technology adoption and diffusion have been the topic of many researches (Rogers 1995; Davis 1993, 1989; Tornatzky and Klein 1982; Bajaj and Nidumolu 1998; Igbaria *et al.* 1997). In communication literature, diffusion is defined as “the process by which an innovation is communicated through certain channels over time among members of a social system” (Rogers 1995: 171). The diffusion of innovation theory stresses the role of social networks among potential adopters. It seeks to describe, explain and predict the adoption behavior of a specific group.

Rogers' Innovation diffusion theory is widely accepted model among researchers in the social science (Shen *et al.* 2004; Skoko *et al.* 2006; Alam *et al.* 2007; Premkumar and Roberts 1999). Rogrs has identified five factors which serve to influence the adoption rate of innovations by organizations. These factors include (i) relative advantage (the degree to which an innovation is perceived as being better than the idea it supersedes); (ii) compatibility (the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters); (iii) complexity (the degree to which an innovation is perceived as relatively difficult to understand and

use); (iv) trialability (the degree to which an innovation may be experimented with on a limited basis); and (v) observability (the degree to which the results of an innovation are visible to others).

Like innovation and diffusion theory, another model has been used as the basic theory of adoption of technological products and services is TAM (Davis 1989). The popularity of the Internet has generated large number of research on TAM. The TAM model was also used to study a variety of Internet technologies, such as the World Wide Web (Lederer *et al.* 2000; van der Heijden 2003), intranet (Alam 2009; Yang 2005; Horton *et al.* 2001), electronic commerce adoption (Slyke *et al.* 2005; Lee *et al.* 2001; Olson and Boyer 2003), because it was originally developed to study computer-based technologies (Yang 2005). Furthermore, it has been extended its application to diverse types of IS, such as personal computing (Agarwal and Prasad 1999), and some other software (Venkatesh 1999; Venkatesh and Davis 2000). The TAM model focuses on the attitudinal explanations of intention to use a specific technology or service. TAM predicts user acceptance based on five specific behavioral beliefs. First of these beliefs is “perceive ease of use (PEU), which is defined as the “degree to which a person believes that using a particular system would be free of effort” (van der Heijden 2003). The second belief is “perceived usefulness” (PU), which is defined as “the degree to which a person believes using a particular system would enhance his or her job performance” (van der Heijden 2003: 542). Other key components in the model include “attitude toward using” (AT), “behavioural intention to use” (BI), and “actual use” (AU) (Legris *et al.* 2003). “Attitude toward using” (AT) is determined by user’s PU and PEOU in information technology use (O’Cass and Fenench 2003).

The Rogers and Davis models are complementary, and both are widely supported in the empirical research and follow up the research. Davis’s two basic theoretical constructs are very similar within the Roger’s model. Specifically, usefulness is similar to Roger’s factor of relative advantage and ease of use is similar to Roger’s factor of complexity (Roberts 2004; Agarwal and Prasad 1997; Chong 2006).

Researchers also identified several other factors that influence the adoption of IT in the SMEs. Among these are the cost of technology (Alam 2009; Chong 2006; Saunders and Clark 1992; Cragg and King 1993; Iacovou *et al.* 1995), external pressure (Fink and Kazakoff 1997; Hart and Saunders 1994), owner-manager’s characteristics (van Akkeren and Cavaye 1999) and security (Limthongchai and Speece 2003; Kendall *et al.* 2001) . In studies of technology adoption in SMEs, researchers have emphasizes on the owners/managers of SMEs especially their characteristics, behaviours and attitudes (Thong 1999; Damanpour 1991; Fichman and Kemerer 1997). This is because of such individuals usually directly and/or indirectly involved in all decision making in their organization. Lakhnupal (1994) reveals that individual characteristics i.e., innovators, leaders and other individual attributes in key positions have significant impacts on explaining differences in the degree of innovation adoption. Therefore, these factors are worthy to be used to explain the adoption patterns of EC by SMEs in Malaysia.

The cost of adoption and maintenance of system is indeed an important factor for SMEs. No SME will be interested to adopt E-commerce or ICT unless the benefits outweigh

the costs of developing and maintaining the system (Vatanasakdakul *et al.* 2004). They argue that SMEs are generally concerned about the costs of establishing and maintaining e-commerce since they generally suffer from budget constraints and are less sure of the expected returns on the investment. Indeed, SMEs, especially those that outsource Web page design and updating, have found it difficult to contain site development costs which are more or less beyond the firm's control (Ernst and Young 2001)

Indeed, this study is focused on the adoption and utilization of the Internet in developing countries which is greatly benefited from the research model of adoption of information technology in small business (Hazbo *et al.* 2006; Ratnasingham 1997; Premkumar and Roberts 1999; Thong and Yap 1996).

4. Research Model and Hypotheses of this Study

By drawing on the two major diffusion models discussed above and recent technological literature, an integrated model of e-commerce adoption in Malaysian SMEs is developed. The theoretical framework combines the Rogers and Davis models and adds the factors of cost, external pressure and owner-manager's characteristics as other likely explanatory factors (see Fig. 1).

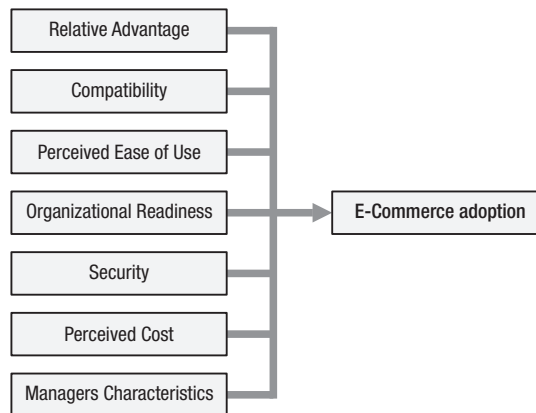


Fig. 1. Research Model

On the basis of existing literature, a one stage normative model was developed which provides the basis of research objectives. This model, depicted in Figure 1, relates the independent and dependent variables without any intervening variables. In lieu of causal relationship, the model is shown as assertive in nature. The model consists of seven variables that we posit to have an effect on adoption of e-commerce. Each of the variables is discussed below:

4.1. Relative Advantage

Relative advantage is viewed as an advantage for an organization over previous ways of performing the same task (Agarwal and Prasad 1997). Relative advantage has been found to be one of the best predictors and positively related to an innovation's rate of

adoption (Premkumar *et al.* 1994; Rogers 1995; Tan and Teo 2000; Alam *et al.* 2007). In view of the advantages that e-commerce offer, it would thus be expected that companies who perceived e-commerce as advantageous would likely to adopt the e-commerce. This leads to the first hypothesis:

Hypothesis 1: *SMEs with greater perceived advantages from the implementation of e-commerce are more likely to pursue its adoption.*

4.2. Compatibility

Tornatzky and Klein (1982) found that an innovation is more likely to be adopted when it is compatible with individuals' job responsibility and value system. It will be adopted not only if it is compatible with deeply held cultural values but also if it is compatible with previous ideas. Compatibility of the innovation with a preceding idea can either speed up or retard its rate of adoption in the organization. The degree to which innovation meets client needs is another dimension of compatibility of an innovation. Organization should seek to determine the needs of their customers, and then recommend innovations that fulfill these needs. When felt needs is met, a faster rate of adoption usually occurs (Rogers 1995). When an innovation is viewed irrelevant to its needs, but it seems technically and financially better quality in accomplishing a given task, it may not be adopted (Rogers 1995). If e-commerce is perceived as compatible with the organizations total business procedures, the organisation will be more likely adopt it. Thus, the hypothesis is:

Hypothesis 2: *Perceived compatibility will have a positive effect on implementation of e-commerce by Malaysian SMEs.*

4.3. Perceived Ease of Use

Information systems that user perceive easier to use in their business and less complex to increase the likelihood of its adoption and usage (Lee *et al.* 2001; Tan and Teo 2000). According to TAM perceived ease of use (PEOU) is a major factor that affects acceptance of information system (Davis *et al.* 1989). PEOU is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989). If the appropriate skills and understanding of the technology are in place then the use of e-commerce will be easier thus it is more likely to be accepted by users. By applying these into e-commerce context we hypothesize:

Hypothesis 3: *Perceived ease of use will have a positive effect on implementation of e-commerce by Malaysian SMEs.*

4.4. Organisational Readiness

The level of organizational readiness has often been identified as a predictor of successful IT adoption (Grandon and Pearson 2002; Thatcher and Foster 2002; Chwelos *et al.* 2001; Crook and Kumar 1998; Iacovou *et al.* 1995). Organisational readiness reflects a firm's technological capabilities, or the level of use of innovative knowledge and skills (Dosi 1991). An organisation without such capacity lacks readiness and will be less like-

ly to adopt innovation. SMEs with insufficient readiness may incur higher initial costs when implementing innovation (Wang and Tsai 2002). Newcomer and Caudle (1991) posit that access to adequate equipment in the organization is a major determinant of the adoption of new technologies. Similarly, Cohen and Levinthal (1990) pointed out that introduction and implementation of innovation depend on the firms' preexisting knowledge in areas relating to the intended innovation. Thus we propose that:

Hypothesis 4: *SMEs at a higher state of readiness are more likely to adopt e-commerce.*

4.5. Security

Internet security has been regarded as the key to e-commerce diffusion (Alam *et al.* 2004; Mukti 2000; Udo 2001; Aldridge *et al.* 1997; Bauman *et al.* 1996). A number of studies (Limthongchai and Speece 2003; Shi and Salesky 1994; Kendall *et al.* 2001) have found that one of major barrier in developing E-commerce is the security of using E-commerce. To adopt E-commerce information safety it is essential for the company to have integrity of the entire system (Alam *et al.* 2004). A study conducted by Beale (1999) revealed that the reluctance among many consumers to embrace e-commerce is basically centered on the concerns over security issues and lack of confidence in the current set-up e-commerce.

In addition, a survey of SME E-commerce in 1999, conducted by Price Waterhouse Coopers, showed that concern about security/privacy is perceived as the third most important barrier to the use of E-commerce by SMEs. The fear of losing trade secrets will create reluctance for SMEs to consider entering the E-commerce business arena (Killikanya 2000). This leads to the fifth hypothesis:

Hypothesis 5: *SMEs with higher perceived security risks are less likely to adopt e-commerce.*

4.6. Perceived Cost

The cost of adoption is an important factor in the adoption and utilization of the Web (Ernst and Young 2001). Innovation cost is expected to negatively affect innovation adoption-the more expensive the innovation, the less likely that it will be adopted by the organisation (Mansfield 1968; Davis 1979). The costs of e-commerce include investment in the process of its adoption (networks, PCs, data storage, demonstration, servers, software/hardware and other peripheral devices) (Wang and Tsai 2002). Non-interested business organizations do not adopt e-commerce may think it is not necessary for their businesses, as it is too expensive to implement at the early stage of e-commerce adoption. The cost factor was studied by various IS researchers (Seyal and Rahim 2006; Premkumar *et al.* 1997; Drury and Farhoomad 1996; Cox and Ghoneim 1996) and found direct and significant relationship between cost and adoption of technology. The lower cost of adoption and the higher new innovation such as the e-commerce will be adopted by the company and vice versa.

Hypothesis 6: *SMEs with perceive higher costs in the adoption of e-commerce are less likely to adopt e-commerce.*

4.7. Managers Characteristics

Adoption of e-commerce is heavily reliant on the acceptance of e-commerce technology by the business owner (Cloete *et al.* 2002). It can be summarized from the previous research that managers' characteristics are important factors affecting the adoption and utilization of the Web. Manager is an entrepreneur figure who is crucial in determining the innovative attitude of a small business (Rizzoni 1991). From Therefore, managers' characteristics are expected to influence the adoption of e-commerce (Mirchandani and Motwani 2001). This is because managers determine the management style of the company. Managers' characteristics which include prior experiences, resistance to change, education level and training are important factors that affect the adoption and utilization of the Web (Torcchia and Janda 2000; Larsen and Wetherbe 1999; Woodcock and Chen 2000; Nutt 1995; Folger and Sharlicki 1999; Mick and Fournier 1998; Thong and Yap 1996). This leads to the seventh hypothesis:

Hypotheses 7: SMEs with Managers who have more positive attitude towards adoption of e-commerce are more likely to adopt e-commerce.

5. Research methodology

An empirical study was designed to test the research framework and the abovementioned hypotheses. We will briefly address here some methodological issues related to the subject (section 5.1) data collection (section 5.2) and the measurement of variables (sections 5.3).

5.1. Population

The study was concerned with small businesses located in Klang Valley in Malaysia. The logic behind for choosing this Klang valley area, Klang Valley is the main business centre in the country and it is on the advantageous edge in this study as it is equipped with modern facilities, such as fast Internet connections and advanced telecommunications system, compared to other states in Malaysia (Siwar and Kasim 1997). We afford to get the sampling frame from the Small and Medium Industries Development Corporation (SMIDEC) in which the listed members in the Malaysia were selected from the list. The target groups were considered based on the number of employees in the business as it is the most commonly used in management research (Ghobandian and Gallear 1996; Haksever 1996; Terziovski *et al.* 1997). In addition, the list also provides the information on company's location, the contact person and correspondent address of the companies which was used during the data collection.

5.2. Data collection

As mentioned earlier, the focus of the field survey was SMEs in Klang Valley, Malaysia. From the sampling frame, only a total of 441 SMEs are listed with SMIDEC were eligible to be selected as part of research samples. As such, all of them were chosen as the research samples.

Survey instrument packages consisting of a cover letter, a questionnaire and a stamped reply envelope were mailed to the 441 companies of the research sample. The contact

person identified was typically either the owner of the business or a top-level manager in the organization. Thirty nine envelopes were return either due to an incorrect mailing address or the organization no longer existed.

Approximately two weeks after the initial mailing, the researchers personally contacted selected respondents over telephone to request their participation in the survey. In this process, some respondents agreed to be interviewed personally. A total of 205 completed questionnaires were received, (a response rate of 46%). However, 5 questionnaires were discarded due to incomplete responses and finally 200 completed questionnaires were used for analysis.

A profile of the responding companies is shown in Table 1. The majority of the surveyed companies are service provider (63%) while 37% are from manufacturing sectors. A slight majority of the surveyed companies (56%) had been in business for a period of 1 to 2 years. While only 18 companies (9% of the sample) have been in business for less than 1 year, 35% companies were in business for over five years. Even though about 62 percent of the respondents indicats some form of Internet applications, more than

Table 1. Demographic Profile and descriptive statistics

	Frequency	Percent
Primary activity		
Manufacturing	74	37
Service	126	63
Years in business operation		
Less than 1 year	18	9
1 year to less than 5 years	112	56
5 to years less than 10 years	52	26
10 years or above	18	9
Respondents' Education level		
Non graduate	44	22
Graduate	130	65
Postgraduate	26	13
Respondents' Ethnic Background		
Malay	48	24
Chinese	122	61
Indian	24	12
Others	6	3
Total	200	100
Internet usage		
Internet user	124	62
Internet non-user	76	38
Years of Internet usage		
Less than 1 year	30	24.19
1 year to less than 5 years	47	37.90
5 to less than 10 years	37	29.84
10 years or above	10	8.07

37.9 percent of them have been using Internet between 1–3 years, and only 10 companies have been using Internet for more than 4 years. In fact, only about 29.84 percent of the responding companies uses the Internet between 3 to less than 4 years

The results indicate that respondents are well educated with over 78% holding undergraduate or postgraduate degrees. The majority of them are Chinese (61%), while only one-third of the respondents were ethnic Malay (24%) and Indian (12%) managers.

5.3. Measuring instrument

The measurement methods used in this study were drawn from literature on IS and e-commerce. For all concepts, we asked respondents to rate their level of agreement with statements using 6-point scales (6 = strongly agree and 1 = strongly disagree). The measures of relative advantage, compatibility and security were adapted from Alam *et al.* (2007). Ease of use was measured using items adapted from Davis' TAM model (Davis 1989). Perceived cost was measured using three-item scale developed by Premkumar *et al.* (1997). Level of organizational readiness was constructed the study of Iacovou *et al.* (1995) and Scupola (2003). In this study, respondents were asked to indicate: "To extent an organization feels ready to adopt e-commerce". The four organizational readiness components are: skill and knowledge of the technology, internal IT support, financial resources and external parties such as IT vendors. Three items of Managers' characteristic variable was assessed in this study. The responses were obtained on a six-point Likert scale, (6 = strongly agree and 1 = strongly disagree). The three items: interest of the top management, feelings on importance of e-commerce adoption and encouraging role of top management.

5.4. Test of reliability, validity and identification of factors

The measurement of reliability provides consistency in the measurement of variables. Internal consistency reliability is the most commonly used psychometric measured assessing survey instrument and scales (Zhang *et al.* 2000). Cronbach alpha is the basic formula for determining the reliability based on internal consistency (Kim and Cha 2002). The alpha values for relative advantage yields reliability co-efficient of 0.891 as shown in Table 2. This value far exceeds the minimum standard of 0.7 set by Nunnally (1978). The value of 0.891 generates a strong indication that there is an internal consistency in the measurement. Similarly, the five statements measure for compatibility generates a Cronbach Alpha value of 0.899, highlighting an internal consistency in the measurement.

The values of alpha obtained for ease of use is 0.885, which suggest that scale is reliable for use in this study. The measures for organizational readiness and security gave respective Cronbach Alpha values of 0.896 and 0.903 also are being supportive.

The high reliability coefficient for cost (0.832) indicates high internal consistency among its statements. This is consistent with reports by Nunnally (1978). The three items of manager characteristics scale, is used to measure the extent of the respondents' perception of their as being supportive. The Cronbach Alpha found in this study is 0.808. Since the Cronbach's alpha values are in between 0.808 to 0.903 and all above cut off limit, that is 0.7, the constructs are therefore deemed to have adequate reliability.

5.5. Test for content validity

Content validity represents the adequacy with which a specific domain of content has been samples, in other words whether instrument is truly a comprehensive measure of area under study. Its determination is subjective and judgmental (Nunnally 1978). The questionnaire is based on extensive literature survey and opinions of experts in the e-commerce area and hence, it demonstrates content validity.

5.6. Test for construct validity: factor analysis

Construct validity represents the extent to which the items in a scale measure the same construct. Exploratory factor analysis was used in order to identify underlying constructs and investigate relationships among key survey interval-scaled questions regarding intent to adopt e-commerce in the SMEs. Principal axis factoring was carried out, followed by varimax rotation with Kaiser Normalisation. Varimax rotation facilitated interpretability. The Kaiser-Mayer Olkin measure of sampling adequacy (KMO) was first computed to determine the suitability of using factor analysis.

The factors with eigenvalues of more than 1.0 only have been retained. All factors with eigenvalues less than 1.0 are considered insignificant and hence dropped. A total of seven factors with eigenvalues greater than 1.0 were identified. These factors explained 72.23% of the total variance. Under the seven conditions for e-commerce adoption considered in this study, the combined results of factor analysis (Table 2) indicates that most items loaded properly on their expected factors. However one item of relative loaded together with compatibility items and it was deleted for further analysis.

Table 2. Results of Factor and Reliability Analysis

Factors with Items Loaded in Each Factor	Factor Loading	Eigen-value of Rotated Factors	Cronbach Alpha
Relative Advantage		16.194	0.899
Expand market share and increase the customer base	0.747		
Will increase company's sales and revenues	0.719		
Reduce operating procedure	0.511		
Improve company's image	0.740		
Will increase the competitive advantage for our company	0.717		
Provides easy access to competitors and product information	0.757		
Compatibility		32.270	0.891
Company's traditional operating procedures	0.726		
Company's current operations/procedures	0.753		
Existing values	0.801		
Suppliers' and customers' ways of doing business	0.697		
Culture	0.616		

End of Table 2

Factors with Items Loaded in Each Factor	Factor Loading	Eigen-value of Rotated Factors	Cronbach Alpha
Ease of Use		6.568	0.885
E-commerce to be flexible interact with	0.771		
E-commerce would be clear and understandable	0.835		
Ease for me to become skillful at using e-commerce	0.654		
E-commerce easy to use	0.718		
Learning to operate EC would be easy	0.735		
Organisational Readiness		3.148	0.808
Financial resources to adopt e-commerce	0.474		
Technological resources to adopt e-commerce	0.683		
Skill and knowledge	0.556		
External support	0.539		
Security		4.420	0.903
Current laws and regulations are sufficient to protect e-commerce user's Interest	0.729		
My company does not have confidence in the payment system of e-commerce	0.724		
My company is concerned that information involved in a transaction over the Internet is not private	0.615		
My company lacks confidence about the security of e-commerce transactions	0.703		
Cost		4.225	0.832
High set up cost	0.702		
Additional staff required	0.675		
Difficult to justify cost and benefits	0.687		
Managerial Characteristics		5.414	0.896
Interest of the top management,	0.787		
Feelings on importance of e-commerce adoption	0.766		
Encouraging role of top management.	0.731		
Rotation method: Varimax			
KMO- .862 Bartlett's Test of Sphericity sig. .000			

Relative advantage and compatibility items also loaded together in other e-government and IT adoption research (Carter and Belanger 2003; Karahanna *et al.* 1999; Moore and Benbasat's 1991) study. Carter and Belanger concluded that "it is unlikely that respondents would perceive the various advantages of using [state e-Government services], if its use were in fact not compatible with the respondents' experience or life style".

6. Results

Data Analysis

The data were analysed using multiple linear regression analysis following the guidelines established by Hair *et al.* (1998). The purpose of regression analysis is to relate a dependent variable to a set of independent variables (Mendenhal and Sincich 1993) and find out the ability of each independent variable to explain the dependent variable. Multiple Regression analysis is an appropriate analytical technique for the research question of this study that seeks to find out the relationship between E-commerce use intention (dependent variable) and a set of factors such as relative advantage, compatibility, ease of use, organisational readiness, security, perceived cost, and owner/manager's perceptions of E-commerce initiative, (independent variables).

Assumption of multivariate normal distribution, independence of errors, and equality of variance were first tested. This study involves a relatively large sample (200 companies) and therefore, the Central Limit Theorem could be applied and hence there is no question on normality of the data. Two major methods were utilized in order to determine the presence of multicollinearity among independent variables in this study. These methodologies involved calculation of both a Tolerance test and Variance Inflation Factor (VIF) (Kleinbaum *et al.* 1988). The results of these analyzes are presented in Table 3. Multicollinearity was not a concern with this data set as confirmed by the main effect regression models with variance inflation factors (VIF range from 1.390 to 2.767), as it is well below 10. As can be seen from this data, none of the Tolerance levels is < or equal to .01. The acceptable Durbin – Watson range is between 1.5 and 2.5. In this analysis Durbin – Watson value of 1.722, which is between the acceptable ranges, show that there were no auto correlation problems in the data used in this research. Thus, the measures selected for assessing independent variables in this study do not reach levels indicate of multicollinearity.

In Table 4 the results of the individual hypotheses that were being tested are presented. The model explained 55 percent of the variance in SMEs' adoption of e-commerce (53 when adjusted for the population). Highly significant F-value indicates very good

Table 3. Test of Collinearity

Variable	Tolerance	VIF
Composite Relative Advantage	0.573	1.745
Composite Compatibility	0.500	2.002
Composite Ease of Use	0.720	1.390
Composite Organisational Readiness	0.460	2.172
Composite Security	0.361	2.767
Composite Perceived Cost	0.426	2.347
Composite Managers Characteristics	0.536	1.866

model fit ($F = 32.910$, $p < .0001$). Five of the seven adoption factors – relative advantage, compatibility, managers’ characteristics, organizational readiness and security – were found to be significant in predicting SMEs’ intention to adopt e-commerce. Findings are discussed in the section to follow.

Table 4. Multiple Regression Results

Variable	Coefficient	t-value	Sig.	Supported
Constant	1.587	4.085	.000	
Relative Advantage	0.123	2.459	.015*	Yes
Compatibility	0.282	3.951	.000**	Yes
Ease of Use	-0.017	-0.348	.728	No
Organisational Readiness	0.247	3.454	.000**	Yes
Security	-0.306	3.902	.000**	Yes
Perceived Cost	0.044	0.585	.559	No
Managers Characteristics	0.266	4.030	.000**	Yes
R ² 0.55				
Adjusted R ² 0.53				
F-value (sig. level): 32.91**				

Level of significance of the t-value: * $p \leq 0.05$; ** $p \leq .001$

7. Discussion

The purpose of this study is to identify the major factors influencing e-commerce adoption by SMEs in Malaysia. As mentioned earlier, perceive relative advantage, compatibility, managers’ characteristics, organizational readiness and security were found to be significant in predicting SMEs intention to use e-commerce. We discuss the results in this section with implications for practitioners with respect to what can be done to improve SMEs’ perceptions to adopt e-commerce.

7.1. Relative advantage

Multiple regression result indicates that SME managers’ perceived relative advantage is a significant predictor of e-commerce adoption ($\beta = .123$; t-value 2.459 significant at $p \geq 0.05$), which lends support to the first hypothesis and similar finding reported in Hoppe *et al.* (2001). It is expected since past literature has consistently shown that perceived relative advantage has a significant and positive influence on the adoption of new innovations (Tan and Teo 2000; Holak and Lehmann 1990; Tornatzky and Klein 1982). This finding suggests that when e-commerce is perceived as being better than the idea it supersedes, and beneficial to SMEs, its adoption is more likely. Adoption of e-commerce benefits SMEs overall operating costs, expand market share and increase customer base, improve public relations to improve image.

The government agencies, such as The Multimedia Development Corporation (MDeC), Malaysian Communications and Multimedia Commission (MCMC), National Productiv-

ity Council (NPC), Small and Medium Industries Development Corporation (SMIDEC) should identify and communicate to SMEs the advantage of e-commerce as means of selling, buying, providing customer services, advertising with global customers. As a result of e-commerce SMEs can sell their product all over the world and customer will get faster services from them. For example, government agencies could encourage the adoption of Web Site to sell their products/services by emphasizing its convenience and speed up compared to brick-and-mortar business. Online sales can be occurs from the home and office 24 hours a day, seven days a week. The selling and customer services aren't limited to standard business hours. The customer can complete this transaction whenever and from wherever it most convenient. The online sales and buying are also quicker than the traditional method of business since the customers don't have to visit the shop existing at far from the customers place. The online services are immediately available to each customer individually.

7.2. Compatibility

Higher levels of perceived compatibility are associated with increased intentions to adopt e-commerce in the businesses. Studies like those carried out by Tan and Teo (2000); Hoppe *et al.* (2001); Cooper and Zmud (1990); Tornatzky and Klein (1982) have generally shown that perceived compatibility of an innovation has a positive influence on the adoption of the innovation. From the Table 4, regression analysis compatibility showed significant influence over the adoption of e-commerce (beta = 0.282, p-value = 0.001). This research therefore further proves the earlier findings that showed, Internet users who feel that using e-commerce is compatible with their working are more inclined to adopt such services.

Many developed countries now embrace Internet technology in their business (Web Site, E-commerce, and E-business), leisure (Instant messaging and virtual communities) and health (E-health). Owner/managers and the employee of SMEs have adopted Internet in their home or office is likely to adopt e-commerce in their business as well. Owners/managers who adopted Internet technologies can be expected to view e-commerce initiatives as compatible with their business. Internet adopters are comfortable searching for information about product and services, providing personal information and conducting transaction electronically. These business owners/managers will have higher intentions to use e-commerce than those who view this e-commerce as incompatible with their business.

7.3. Ease of use

Perceived ease of use are not significantly associated with increase use intentions of e-commerce. Negative sign shows that e-commerce is not easy to be use in SMEs in Malaysia. Previous studies found that complexity has significant negative effect on e-commerce adoption in the business (Alam *et al.* 2007; Cheung 1998; Tan and Teo 2000; Lederer *et al.* 1999; Cockburn and Wilson 1996). Multiple regression analysis shows results of ease of use (beta = -0.017, p-value = .728), indicating that complexity have a negative effect upon e-commerce adoption among SMEs. Most of the previous studies

suggest that the more complex new technology is perceived to be, the less likely it is that it will be adopted. One possible reason is that SMEs especially in Malaysia and other developing countries are still reluctant to use the Electronic Commerce in their business operation. According to Statistics of SMI (Small and Medium Scale Industries) Association of Malaysia, only 30 per cent of the SMEs in Malaysia have a web presence and use IT on a daily basis (Hussin and Noor 2005). Since these SMEs are reluctant to use e-commerce, apprehension provoked by potential complexity is most significant deterrent of e-commerce adoption among SMEs.

7.4. Organisational Readiness

The higher levels of organizational readiness are associated with increased intentions to adopt e-commerce among SMEs in Malaysia. Multiple regression analysis shows results of (beta = 0.247, p-value = .001), implying that there is a positive and significant correlation between organizational readiness and e-commerce adoption. This research therefore further proves the earlier findings that showed observability as having a positive and significant influence on e-commerce adoption (Grandon and Pearson 2002; Thatcher and Foster 2002). Existing Internet connection in the business, knowledge and skills of owner/manager and employees about online business reflects a firm's technological capabilities. SMEs without such capacity will be less able to adopt e-commerce into their firms.

7.5. Perceived security

Higher levels of perceived security are associated with decreased intentions to adopt e-commerce initiative. Studies like those carried out by Alam *et al.* (2007), Beale (1999) have generally shown that concern about security is perceived as the most important barrier to the use of e-commerce by businesses. The results of this research show that when owner or manager of SMEs is fear about security the degree of e-commerce adoption is lower. Regression analysis shows results of security (beta = -0.306, p-value = .001), indicating that lack of security have a negative effect upon e-commerce adoption among SMEs in Malaysia. The fear of losing trade secrets will create reluctance for SMEs to consider entering the E-commerce business arena (Killikanya 2000). All of the previous studies suggested that perceived security/confidentiality was also found to be negatively associated with the adoption since it is a major impediment to the adoption of e-commerce.

7.6. Perceived cost

Although the findings show that perceived cost has a positive relationship with e-commerce adoption intentions, this relationship is not significant (beta = 0.044, p-value = .559). One possible reason is that recently, there has been a dramatic increase in the number of business solutions companies in Malaysia, due to the promotion of e-commerce by the government through Multimedia Super Corridor (MSC). It has led to high competition in the markets, whereby companies provide many special services to attract customers with less cost. Customers have many options provided by those companies and user can choose what they want: including access to a free trial, trying

various applications before making a decision, implementation at a certain scale, low start-up cost or ability to get out anytime. Even in Malaysia many government agencies also providing lot of support and subsidies to increase usage of IT in the business these conditions can consequently lead to an unimportance of perceived cost of e-commerce adoption by SMEs.

7.7. Managers characteristics

The managers play important roles in the adoption and utilization of the e-commerce among SMEs. Regression analysis showed managers characteristics having (beta = 0.266, p-value = .0001) indicating that managers who posses computer skills will adopt the Web at a faster rate. This suggests that managers with hands and experience are able to influence the adoption rate of the Web. This is consistent with the study done by Torcchia and Janda (2000) in which they concluded that managers with prior experience in computing and hands on experience influence the adoption of Web.

Managers who have been using the Web for some time are able to know the advantages and disadvantages of the Web. Consequently, the managers are able to use the information of the Web effectively expressed comfort with the Web. This is consistent with the studies had done by Torcchia and Janda (2000) and Larsen and Whetherbe (1999), in which researchers concluded that computer skills and Internet usage in job by managers might increase the efficiency and effectiveness of adoption and utilization of the Web. Therefore, hypothesis 2 is accepted. This further confirmed the consolation made by Thong and Yap (1996) that manager is the main decision-maker of the company and he has the power to determine the adoption of new technology.

8. Limitations and Future Directions

Like other empirical studies, this study is not without its limitations. Our sample consisted of SMEs in Klang Valley in Malaysia may limit the generalizability of the results. Although several e-commerce adoption studies focused on the zone basis (Van Beveren and Thomson 2002), state based respondents, such as experience using technology, differ from state to state from overall population of SMEs. The sample size itself is relatively small. The study can be strengthened by increasing the sample size and including participants in other geographical areas. With an increased sample size, a more detailed empirical analysis among the independent variables and the variables that have multiple categories can be performed. Potential correlations between some of the independent variables (e.g. gender, race, education level of the manager) need to be reported in future study.

9. Implications

9.1. Implications for research

This study presents an introductory research that explains 53 percent of the variance in SMEs adoption of e-commerce. This research can serve as a starting point for other e-commerce adoption research, while encouraging further exploration and integration addition adoption constructs. Future research needs to focus on a larger cross section

and more diversified random samples to verify the findings of the current study. Moreover, to further clarity of the factor influence on e-commerce adoption in the businesses, other model could be used. Future inquiries could also examine the causal relationships between factors and SMEs' perceive overall e-commerce adoption by employing a structural equation modeling technique. In addition, future research needs to examine business-to-business purchase in the context of cross-national differences.

9.2. Implications for practice

The study reveals five significant indicators of SMEs' intention to adopt e-commerce in their business. Government agencies like MCMC, MDeC, SMIDEC, and other government agencies should create better awareness of the benefits of e-commerce to encourage higher rate of adoption. It can be done by having seminars or induction sessions to allow SMEs to evaluate their new inventions. In order to receive greater responses towards e-commerce adoption, it is recommended that authority should give certificate as a token and financial support to attend the seminar. They could establish a close link with all SMEs and get continuous feedback from them in order to identify the problem areas and take necessary actions to rectify them. Another way to enhance the possibility to use e-commerce in the SMEs sectors, government should enforce standardized, consistent and uniform policies in all SMEs sectors, agencies or subsidiaries in implementing e-commerce system. As it is found in this study, respondents mentioned e-commerce is a complex system, and the system should be made as user-friendly as possible as not all users are familiar with computers and the Internet, especially the old SMEs. Providing online help and giving end users the choice of their preferred language will ease of their usage. Management of SMEs should provide adequate pre-training to their employees on how to use e-commerce systems in business at all levels must be ensured so that the employees should get comfortable with its use. Security of information must be ensured with the help of the restricted access level of passwords.

10. Conclusion

The purpose of this study is to investigate factors affecting intention to adopt e-commerce in the SMEs in Malaysia. This study also contributes to and extends our understanding of the Internet as a medium for commercial use in the manufacturing arena, identifying the rationales for adopting or rejecting the Internet based e-commerce by the SMEs. From a managerial viewpoint, the findings provide support for investment decisions, and for decisions relating to the development Internet services that address and take the concerns and needs of companies into consideration.

The research was done under theoretical framework that was developed based on the previous study. The multiple regression analysis shows that relative advantage, compatibility, organizational readiness, managers' characteristics and security are significant elements of e-commerce adoption. The model explains 53 percent of the variance in SMEs intention to adopt e-commerce. As Malaysian government grows in importance and priority for business worldwide, an understanding of the factors that influence SMEs adoption of the e-commerce is invaluable.

Despite some limitations, this research makes some notable contributions. First, we review existing literature in this area and develop a theoretical framework and also identify both an absolute and relative view of the gap. Second, we provide an analysis of the state of the factors driving it that owes its foundation to existing research and extends, thus unifying and advancing the field of knowledge. Finally, we examine the factors contributing to e-commerce adoption and are unique in the research to date.

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VEIKSNIŲ, TURINČIŲ ĮTAKOS ELEKTORINEI PREKYBAI, STUDIJA: MALAIZIJOS PAVYZDYS

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Santrauka

Šiame straipsnyje pristatomas empirinis tyrimas, kuriame analizuojamas e.-komercijos principų taikymas Malaizijos smulkiojo ir vidutinio verslo įmonėse. Tyrimo modelis pristatytas šiame straipsnyje, buvo sudarytas remiantis mokslinės literatūros analize. Autoriai išklė 7 hipotezes, kurias vėliau bandė pagrįsti. Iškeltoms hipotezėms patvirtinti (arba paneigti) buvo atliekamas tyrimas. Tyrime dalyvavo 200 smulkiojo ir vidutinio verslo įmonių, taikančių savo veikloje e.-komercijos principus. Pristatyto tyrimo metu buvo nustatyta ir tai, kad sėkmingam e.-komercijos principų taikymui didelę reikšmę turi ne tik technologiniai sprendimai, bet ir žmogiškasis veiksnys. Autoriai pažymi, kad šis tyrimas yra labai svarbus Malaizijoje įsikūrusioms smulkiojo ir vidutinio verslo įmonėms, nes jame buvo vertinamos tarptautinio verslo perspektyvos globalizacijos kontekste.

Reikšminiai žodžiai: e.-komercija, smulkusis ir vidutinis verslas, santykinis pranašumas, Malaizija.

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