Perceived Attributes of E-Commerce and the Adoption Decision: The Case of Malaysian SMEs

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ABSTRACT

Research on e-commerce adoption in SMEs has gained considerable attention in the past few years. However, most of them were conducted in developed countries such as USA, UK or Australia. This study attempts to understand e-commerce adoption amongst Malaysian SMEs, applying the persuasion stage of the Diffusion of Innovation Model by Rogers's. The objective is to determine the relationship between perceived attributes of e-commerce and the adoption decision by SMEs. A survey method was used to collect data whereby questionnaires were mailed to SME owners or managers in the manufacturing sector. The analysis on 107 responses shows that perceived relative advantage, perceived trialability, and perceived observability have significant influence on the willingness to adopt e-commerce.

Keywords: e-commerce adoption, Diffusion Innovation Model, Malaysian SMEs, Perceived Attributes of e-commerce

ABSTRAK

Kajian terhadap penggunaan e-dagang dikalangan syarikat kecil dan sederhana (SKS) telah mula mendapat perhation. Walau bagaimanapun, kebanyakan kajian dijalankan di negara maju seperti Amerika Syarikat, Britain ataupun Australia. Kajian ini merupakan di antara yang awal dilakukan bagi memahami penggunaan e-dagang dikalangan SKS di Malaysia, dan menggunapakai Model 'Diffusion of Innovation' oleh Rogers. Objektif utama kajian ialah untuk menentukan perkaitan di antara ciri-ciri tanggapan e-dagang dan keputusan untuk menggunakannya dikalangan SKS. Kajian soal selidik dijalankan dengan melibatkan pengurus atau pemilik SKS dalam industri pembuatan. Setelah menganalisis 107 respon yang terkumpul, didapati tanggapan 'relative advantage', tanggapan 'trialability' dan tanggapan 'observability' mempunyai pengaruh yang signifikan terhadap penggunaan e-dagang.

Katakunci: Penggunaan e-dagang, 'Diffusion Innovation Model', SKS Malaysia, ciri-ciri tanggapan e-dagang

INTRODUCTION

Malaysia is one of the countries in the South-East Asian region, and considered to be one of the newly emerging economies that are very keen on promoting information technology (IT) and e-commerce. The Malaysian government has taken several initiatives to promote e-commerce uptake by Malaysian businesses and consumers in the country. Among the initiatives include the setting up of an inter-agency task force on e-commerce in 1997 (BERNAMA, 2006), the launching of a five-year IT Master plan known as MyICMS 886 (MEWC, 2006), and the introduction of Cyber Laws which include the Electronic Commerce Bill 2006.

In terms of Internet penetration, the number of Internet subscribers in Malaysia reached 1.5 million in mid-2000, or about 6.88 percent of the country's population (ITU, 2000). That penetration rate is on par with a few other emerging economies such as Hungary (6.38) and Poland (6.97), and way ahead of many others, including Argentina (2.44) and Thailand (1.65). With Internet usage being a condition for e-commerce adoption, it is safe to say that Malaysia has a great potential for e-commerce growth.

Despite the above scenario, e-commerce penetration among Malaysian businesses is still low, particularly amongst small and medium-sized enterprises (SMEs) (UNDP Report, 2007). The report cited the reasons for the reluctance among SMEs to participate in e-commerce as: SMEs not convinced of the benefits of e-commerce, lack of trained staff, lack of capital, apparent failure after initial experimentation, concerns for security and lack of awareness of government incentives. Omar and Abd. Hamid (2002) highlighted that studies on SMEs in the Malaysian context have not yet reached an in-depth analysis especially concerning the issues of electronic endeavor. This study attempts to fill this gap in trying to empirically investigate e-commerce adoption by Malaysian SMEs focusing on the persuasion stage of the Diffusion of Innovation Model (DIM).
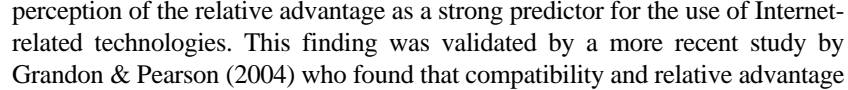
RELATED WORK

There have been numerous studies on e-commerce adoption by SMEs, particularly in the context of developed countries (Lee & Runge 2001; Chong 2004; Grandon & Pearson 2004). A few have also been conducted in the context of developing countries (Kendall et al. 2001; Lertwongsatien et al. 2004; Looi 2005). Generally, past researchers agreed on the view that SMEs have been slow in adopting e-commerce despite the benefits SMEs should be able to achieve. Raymond et al. (2005) highlighted that this situation may relate to the specificity of SMEs compared to larger firms in terms of their environment, structure, strategy and decision process, and psychological context such as the dominant role of the owner-manager.

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Many past studies on e-commerce and SMEs have explored factors that influence SME adoption decision in various contexts. Teo (2004) has conducted a meta-analysis on the factors affecting e-commerce adoption by SMEs and concluded that there are conflicting reports regarding whether or not a factor affects adoption of e-commerce. In other words, despite numerous studies on this topic, the results are still inconclusive. The case for the developing country or an emerging economy all the more warrants investigation as these contexts are under researched.

One factor that was consistently cited as being an important predictor for SME e-commerce adoption is the technological context. The technological context represents the pool of technologies for adoption by the firm and firm's current technological resources. Specifically, technological context refers to the innovation that is to be adopted by the organization (Tornatzky & Fleischer, 1990). One aspect of the technological context relates to the perceived characteristics of the innovation. In the context of this paper, the technological context refers to the perceived attributes or characteristics of e-commerce from the perspective of the SMEs' top management.

There have been several studies that have explored perceived characteristics of e-commerce and SMEs and found that this factor to be significant. For example, Lee & Runge's study (2001) on US SMEs found owners' positive perception of the relative advantage as a strong predictor for the use of Internet-related technologies. This finding was validated by a more recent study by Grandon & Pearson (2004) who found that compatibility and relative advantage emerged as significant predictors for e-commerce adoption by US SMEs. Chong's study (2004) on Australian SMEs using perceived characteristics of EC as one of the variables also found relative advantage, trialability, and observability as significant predictors of e-commerce adoption among SMEs.

In the context of South East Asian region, Kendall et al. (2001) conducted a survey on Singapore's SMEs and found that relative advantage, compatibility and trialability were significantly related to e-commerce adoption. Lertwongsatien et al.'s study (2004) on Thailand SMEs found perceived benefits and perceived compatibility as significant predictors to e-commerce adoption. Another study by Looi (2005) explored e-commerce adoption by SMEs in Brunei Darussalam.

Despite numerous research conducted to examine the role of technological factor on SME e-commerce adoption, the findings are still inconclusive. For example, Thong (1999) found that perceived compatibility was a major factor, whilst Chong (2004) found perceived compatibility was inversely related to adoption. This implied that a factor might impact on SMEs depending on the context of the SMEs. While other research aimed to cover comprehensive antecedent factors, this research adopted a more focused approach where the persuasion stage of the Diffusion of Innovation Model by Rogers would be tested in the context of Malaysian manufacturing SMEs.

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SMEs play an important role in the Malaysian economy. The census study in 2005 based on manufacturing, services and agriculture sectors found that SMEs account for 99% of total business establishments, contributed to 38% of total outputs and represents 55% of total workforce (NSDC, 2005). The National SME Development Council (NSDC) was set up in 2004 to provide the strategic framework for more focused and coordinated inter-agency efforts on SME development (Bank Negara Malaysia, 2004). In 2006, a National SME Development Blueprint was launched that include a total of 245 programs that were planned to be implemented in 2006 to accelerate the development of SMEs.

Related to ICT incentives, in 2002 for example, the Government has provided a matching grant for SMEs to acquire and implement the ERP solution in their manufacturing operations through the e-Manufacturing Grant Scheme. To support the participation of SMEs in the international supply chain, the Government has provided financial assistance for eligible SMEs in the Electrical and Electronic sector to adopt the RosettaNet common messaging standards for business communications. As was reported in SMI Business Directory (2003), most of the programs aimed to encourage SMEs to foster linkage with large companies through the supply of essentials parts, components, vendor schemes, franchisers and services.

Despite the government's incentives, the uptake of ICT and e-commerce amongst SMEs is still slow. The SMI Association of Malaysia reported that ICT implementation among local SMEs is still at a very basic level (SMI Directory, 2003). According to the secretary of the association, about 90% of the 100,000 local SMEs use PCs for simple operations such as basic accounting, financial data and word processing. Only about 30% of the local SMEs have some kind of web presence and use technology in their daily operations. Another study by Zakaria & Hashim (2003) found that only 15% of the Malaysian SMEs incorporated some form of Internet applications into their business processes.

A few studies have examined further on e-commerce use among SMEs in Malaysia. For example, Ismail and Ishak (2005) studied on SMEs in the metropolitan area and found that e-commerce has been used as a complementary method of doing business. The responding SMEs were not sure whether e-commerce has generated incremental revenues and the impediments to use of e-commerce are predominantly Internet-related including security and unstable data communication. Norhayati (2000) in a survey on SMEs in the Klang Valley area revealed that about 70% of the respondents believed that security aspects was the most important barrier to e-commerce development. This finding was supported by Zakaria & Hashim's (2003) and Mohammad et al.'s studies (2005) which stated that the lack of security and reliability as the most important concern to e-commerce adoption.

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Despite the above concerns, some Malaysian companies are showing interest on conducting business online. In their study of e-commerce in Malaysia's manufacturing sector, Sulaiman and Jani (2000) found that companies have begun processing sales orders, procurement and goods tracking online. A study by Suraya (2005) to explore e-business opportunities amongst Malaysian travel agencies found that these companies are very positive towards e-business. In conclusion, while the level of e-commerce adoption by SMEs in the country is still not satisfactory, the potential is high. Therefore, it is important that more studies are conducted in the area to gain better insights on the phenomenon.

RESEARCH FRAMEWORK

The classical theory on Diffusion of Innovations introduced by Rogers (1995) has been widely used in the past literature. The theory forms the basis of this research. Rogers defined diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. Innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 1995). In this research, following the practice of some researchers, e-commerce is regarded as an innovation (Kendall et al. 2001; Chong 2004). Figure 1 shows the Diffusion of Innovation Model (DIM) graphically.
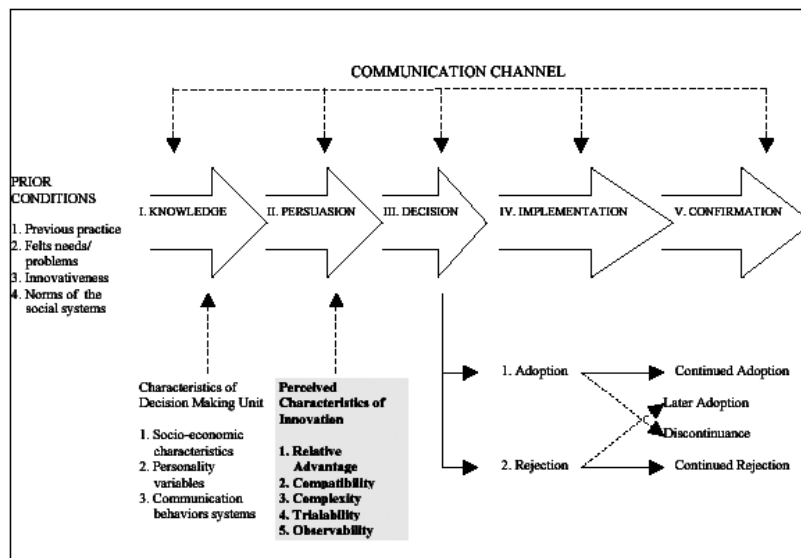

FIGURE 1. Diffusion of Innovation Model (Rogers, 1995)

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Figure 1 shows that DIM have five stages of decision process that move over certain time periods before an innovation is adopted. The stages are: knowledge, persuasion, decision, implementation, and confirmation. The adoption process begins with knowledge of the existence of the innovation. This is followed by the persuasion period. During this phase, potentials adopters gather information from various sources and attempt to determine the utility of the innovations. Often early adopters who are typically innovators themselves, or in some cases change agents, attempt to convince the general user population of the benefits of the innovation. If the benefit is in favor of adoption, an implementation phase follows. At this stage, the innovation may become incorporated into the culture of the user population or it may undergo change (re-invention), or it may be discontinued.

Among these five stages, the second stage which focused on the perceived characteristics of the innovation, has been studied more frequently and is generally considered most significant in explaining the rate of adoption. According to Rogers (1995), the five perceived attributes of an innovation, namely, relative advantage, complexity, compatibility, trialability, and observability are the main determinants explaining 49-87% of the variance in the rate of the adoption.

DIM has been used by several past studies on e-commerce adoption and SMEs (Kendall et al. 2001; Chong 2004; Lee & Runge 2001). However, the application of innovation decision model by the Rogers to the study of e-commerce adoption in Malaysian SMEs is new. The aim of this research is to study SMEs' willingness to adopt different stages of conducting business online with the five perceived characteristics of e-commerce, adapted from the model by Rogers (1995). The five characteristics are briefly described in the following sub-section.

PERCEIVED ATTRIBUTES OF E-COMMERCE

Relative Advantage is the belief of performing such behavior will result in obtaining certain benefits in return. In this research, it means the benefits perceived by SMEs in adopting e-commerce to conduct business. Rogers (1995) defined relative advantage as the degree to which "*an innovation is perceived as being better than the idea it supercedes*". To the degree that the owner/manager of SMEs perceives e-commerce as offering more advantages relative to the firm's current state, it is more likely to be adopted. Hence, Hypothesis 1 was derived:

H1: The more perceived relative advantage of e-commerce, the more likely e-commerce will be adopted.
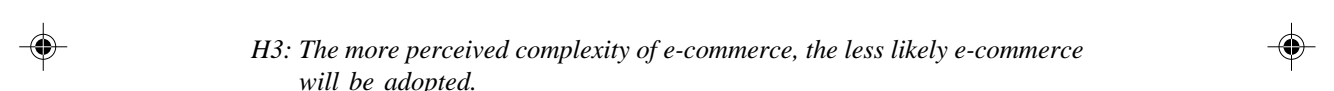
Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences and the needs of

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potential adopters (Rogers, 1995). In the case of adoption of e-commerce by SMEs, compatibility deals with how well the e-commerce technology will suit the existing business process, their suppliers and customers, the organizational structure and the perceived match of the business to e-commerce implementation. The higher is the perceived 'fit', the more likely the SME will adopt e-commerce. Hypothesis 2 reflects the relationship postulated:

H2: The more perceived compatibility of e-commerce, the more likely e-commerce will be adopted.

Complexity is defined as the degree to which an innovation is perceived as difficult to understand and use (Rogers, 1995). In this context, e-commerce may be perceived by SME as something complex that it may not be applicable to their level of business. Since SMEs are known to having low level of managerial and technical skills, it is expected that they will perceive implementation of e-commerce as very challenging. On the other aspect, the increasing Internet security violations will severely reduce SME's confidence and indirectly affect their decision to adopt e-commerce. Hypothesis 3 reflects the relationship between the level of complexity perceived and e-commerce adoption:

H3: The more perceived complexity of e-commerce, the less likely e-commerce will be adopted.

Trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers, 1995). A new innovation will be adopted more quickly if it is trialable and has less uncertainty. Kendall et al. (2001) measured trialability as the ability to engage in e-commerce without incurring high start-up cost. The availability of government grants will accelerate the e-commerce adoption especially in SMEs since they have limited financial resources. When grants are given, businesses are able to reduce starts up cost, thus it will enhance the trialability of e-commerce. Hence, hypothesis 4 was derived:

H4: The more perceived trialability of e-commerce, the more likely e-commerce will be adopted

Rogers (1995) defined "observability" as the degree to which the results of an innovation are visible to others. Knowledge of the benefits of e-commerce is likely to be seen and understood if it is observable. The more visible the outcome of the innovation, the more likely it is that the people will adopt it. Hypothesis 5 postulates this relationship:

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H5: The more visible the result of e-commerce adoption, the more likely e-commerce will be adopted by SMEs.

E-COMMERCE ADOPTION

There are various ways to measure technology adoption. Based on the review of previous literatures, Lee (2004) listed different approaches for outcome measures in IT adoption: (1) adoption decision, (2) degree of adoption (3) system use (4) satisfaction, and (5) intention to adopt. While some view e-commerce adoption as a 'single state adoption'. Chong (2004) argued that e-commerce adoption is essentially a continuum involving a range of progressive developments and a broadening variety of applications.

Kendall et al. (2001) measure outcome in the study on the SMEs receptivity to e-commerce by focusing on the willingness to adopt different stages of doing business over the Internet, ranging from having a website to exclusively conducting business online. The willingness or intention to adopt is measured by looking at the time in which the SMEs will adopt a particular stage of e-commerce in the future. Following Kendall et al. (2001), this research measured willingness to adopt e-commerce by asking at what point of time in the future will the SME adopt that particular manifestation of e-commerce. The time scale was measured on 6-points Likert scale which marked with (1) for current user, (2) within 1 year, (3) 1-2 years, (4) 2-5 years, (5) 5-10 years and (6) no intention.

RESEARCH METHOD

The nature of this study is quantitative, in which a survey research method has been adopted. In order to collect data from a large number of SMEs, mailed questionnaire was used as the method of administering survey questions. A pre-test was done to ensure clarity of the survey questions. Further, a pilot study was conducted on a similar sample as the main survey. The result of the pilot study showed that only minor modification was needed, hence the responses from the pilot study were included in the main survey.

This research adapted the revised version of the research instrument used in the study conducted by Kendall et al. (2001). The revised instrument was obtained personally from the researcher. The final instrument used in this research retained all 19 items used by Kendall except one item 'my company will do business over the Internet if grants/subsidies are given' was changed to 'my company is aware of grants/subsidies given by the government to firms that conduct business over the Internet'. The rationale is that, the Malaysian government grants for e-commerce was only introduced recently and many SMEs were not aware of those grants. Table 1 shows the mapping of questionnaire items to DIM's persuasion stage dimensions.

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TABLE 1. Initial Mapping of Survey Questions to
Perceived Attributes of Innovation

Perceived Characteristics of EC	Items
Relative Advantage	Q1 (lower cost), Q2(increase revenue), Q3 (lower human requirement), Q4 (cross international boundaries), Q9(important for business in the future), Q10 (reach customer)
Compatibility	Q6 (compatible with suppliers and customers), Q7 (compatible with company policy), Q8 (compatible with the organizational structure),
Complexity	Q11 (has technical knowledge), Q12 (security of payment), Q13 (no information privacy), Q14 (virus affection)
Trialability	Q5 (short payback period), Q15 (conversion in phases), Q16 (government grant/subsidies)
Observability	Q17 (results of trials by others can be observed), Q18 (others' result of using e-commerce will help in decision making), Q19 (unsure about profit return)

A cluster sampling procedure was undertaken to select manufacturing sector out of the entire SME population in the West Coast of Malaysia. A list of manufacturing records were collected from several directories. The scope of selection was based on the widely used definition of SMEs in Malaysia, "SMEs with annual sales turnover not exceeding RM25 million and with full-time employees not exceeding 150" (SMI Directory, 2003). This study was conducted on the Malaysian SMEs in the manufacturing sector. The manufacturing sector is selected as it is one of the most significant sectors which contribute to the growth in Growth Domestic Product (GDP) in Malaysia.

A study on the perception pertaining to the characteristics of innovation would be more meaningful if a research is able to elicit responses from the main player in the organization. Meckel et al. (2004) highlighted that entering the world of e-business is a strategic decision, and in the case of SMEs, the CEO would normally be the one who make the decision. Hence, the survey questionnaires were sent to CEO or senior executives of manufacturing SMEs. From 735 questionnaires distributed, 147 were returned after about four months which yield about 20% response rate. Final checking on the responses discovered that only 107 responses were useful for further analysis. Among the reasons for exclusion were responses from non-manufacturing sector, responses by other than company's decision maker, and incomplete questionnaires.

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ANALYSIS AND FINDINGS

PROFILE OF THE SAMPLE

It appears that the sample includes about 43% of the companies which are below 10 years of age and the rest are more than 10 years in operation. About half of the sample companies (49.1%) comprise of less than 50 employees; another 45.3% of the sample has the number of employees in the range of 50 – 150. To gauge on the financial performance of the companies in the sample, a question was asked on their turnover for the previous year. About 46% of the companies had below RM1 million annual turnovers and about 30% had turnover in the range of RM1 million to RM5 million. The rest earned more than RM 5 million in the previous year.

On Internet use, the responses indicated that about 95% of the SMEs had Internet connection in their organizations. The result indicated that the Internet was used mainly for email (94%) and seeking information (97%). Only 41% of the respondents used Internet to buy products and 35% used Internet to sell products. 68% of the responding companies already have websites. This figure is quite impressive and implies that SMEs are quite interested in online activities. The main reason for having the website (94%) was to 'provide information to customers'. Interestingly, only 13% of the respondents perceived that 'Pressure from competitor' as a reason for them to have a website.

For the profile of respondents, all of them are holding managerial positions. This shows that the respondents who were involved in this study were qualified to answer the questionnaire, hence should lead to a more accurate finding for the study. The descriptive data also shows that most of the CEOs/managers of the responding SMEs are quite familiar with e-commerce concepts like e-procurement and Customer Relationship Management although they consider themselves not having adequate knowledge on the applications.

WILLINGNESS TO ADOPT E-COMMERCE

As stated earlier, this research measures e-commerce adoption by looking at their willingness to adopt the e-commerce technology over time. Table 2 shows the descriptive results of this willingness to adopt e-commerce by the responding SMEs.

From Table 2, it shows that the first stage, 'Has website' has the highest ranking with the mean score of 1.77 which basically range from 'Current user' to 'Within 1 year'. The next stages in the rank are 'Conduct sales through the Internet' and 'Purchase supplies through the Internet' with 26 users and 20 users respectively. Generally we can conclude that basic e-commerce stages have higher number of current users compared to the more advanced stages, which is expected for the case of SMEs.

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TABLE 2. Different Stages of Doing Business over the Internet

Stages of E-commerce Adoption	No. of current Users	Mean	Std. Dev.
Have a website	73	1.77	1.398
Conduct sales through the Internet	26	3.13	1.632
Purchase supplies through the Internet	20	3.55	1.728
Have suppliers replenish supplies through Internet automatically	10	4.14	1.634
Replace the entire sales function and conduct sale through the Internet only	9	4.66	1.676
Replace entire supply function and purchase from vendors through Internet only	2	4.84	1.319
Conduct all business transactions through the Internet only	2	4.97	1.306

Factor analysis was used to refine the measurement of willingness to adopt e-commerce. The results show that Factor 1 correlates with Questions 2, 3, 4, 5, 6, and 7 (respectively, conduct sale through Internet, purchase supplies, replace sales function, replenish automatically, replace entire supply function and conduct all business transaction), while Factor 2 correlates only with Question 1 (have website). This study appears to be consistent with the study conducted by Kendall et al. (2001), where factor analysis run on similar items also extracted two factors. However, from the study conducted by Kendall et al., it was found that Factor 1 correlated with Questions 3, 5, 6, and 7 (respectively, replace sales function, replenish automatically, replace entire supply function and conduct all business), while Factor 2 correlates highly with Questions 1, 2 and 4 (homepage, conduct sales and purchase supplies). The difference in the items that relate to factors as found by this study and the study by Kendall et al, could be due to the underlying psychometric connection between the seven stages adopted.

Since two factors exist in explaining the adoption of e-commerce by the sample, it was decided to use Factor 1, which represents the transactional use of the Internet by the SMEs, for further analysis. Factor 2 which correlates with only the 'has website' item is thought to be inappropriate as this may not involve online transactions.

PERCEIVED ATTRIBUTES OF E-COMMERCE

To identify the underlying dimensions of e-commerce attributes, factor analysis was conducted. Factor analysis enables exploration of how well the survey questions correlate with the five characteristics identified by Rogers. The result of factor analysis showed that the five factors accounted for about

63% of the total variable variance. From the factor-items correlation matrix after using Varimax rotation, it was observed that most of the items correlate well with the respective factors. However, seven items were found to be deviated from the initial mapping of the items to particular factor. Two items, 'most of suppliers and customers use it' and 'prefer conversion in phases' loaded into different factors from the original mapping. Five other factors, 'has short payback period', 'has technical knowledge', 'able to reach customer', 'important for future business' and 'cross international boundaries' had been excluded from further analysis due to reasons such as cross factor loading, low factor loading, and items not well correlated with the respective factors. These seven items were excluded from further analysis following the criteria used by Green and Salkind (2003).

In order to evaluate the internal consistency of the multiple items scales associated to the particular factors, Cronbach alpha model was used. Table 3 shows the Cronbach Alpha for each factor related to the perceived characteristics of e-commerce.

TABLE 3. Cronbach Alpha Reliability Analysis on Adjusted Factors

Perceived Characteristics of EC	Questions from Part B	Alpha
Relative Advantage	Question 1, 2, 3	0.7477
Compatibility	Question 7, 8	0.7754
Complexity	Question 12,13,14,15	0.70
Trialability	Question 16	NA
Observability	Questions 6,17, 18, 19	0.7695

The result shows that the reliability estimates range from 0.70 to 0.78, which implies that it is sufficient to conduct further analysis.

RELATIONSHIP BETWEEN PERCEIVED ATTRIBUTES AND WILLINGNESS TO ADOPT E-COMMERCE

A multiple regression analysis was conducted to evaluate the relationship between the predictors of perceived characteristics of e-commerce and the adoption of e-commerce in SMEs. Prior to conducting the regression analysis, tests were performed to ascertain that all assumptions were met. Table 4(i) through Table 4(iii) presents the results of multiple regression analysis run on the dependent variable and the five predictors of perceived characteristics of e-commerce.

The linear combination of the perceived characteristic of e-commerce measures was significantly related to the adoption of e-commerce, $F (5, 101) = 4.45$, $p<.001$ as was shown in Table 4(ii). This result shows that SMEs'

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TABLE 4. Regression Analysis Result on Five Attributes of E-commerce

Table 4(i): Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.425	.181	.140	1.13835

Table 4(ii): ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	28.854	5	5.771	4.453	.001
Residual	130.880	101	1.296		
Total	159.734	106			

Table 4(iii): Predictors Coefficients

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.088	.799		2.613	.010
Relative Advantage	.391	.112	.328	3.487	.001
Observability	-.299	.117	-.253	-2.547	.012
Trialability	.191	.081	.223	2.362	.020
Compatibility	5.797E-02	.083	.064	.698	.487
Complexity	-.130	.119	-.105	-1.095	.276

Predictors: (Constant), Trialability, Relative Advantage, Complexity, Compatibility, Observability
Dependent Variable: Willingness to Adopt E-commerce

perception on the characteristics of e-commerce will influence the adoption of e-commerce and how early in the future they will consider the adoption. The sample multiple correlation coefficients is .43, indicating that approximately 18% of the variance of the adoption of e-commerce in the sample can be accounted for by the linear combination of perceived characteristics of e-commerce measures.

From the Tables, relative advantage showed the strongest influence over the adoption of e-commerce. The relationship shows that the greater the perceived relative advantage of e-commerce, the greater the SMEs' willingness to adopt e-commerce. The next predictor which is also significant is

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observability. This means that, the more observable the results of e-commerce adoption, the more likely SMEs will adopt e-commerce. It is found that the relationship is negative and this means the more SMEs rely on the results of earlier adoption, the longer the time taken to adopt e-commerce. Another significant variable in explaining the adoption of e-commerce is trialability, t (105) = 2.36, $p<.05$. This means that the more perceived trialability, the higher SMEs' willingness to adopt e-commerce. Since the relationship is positive, it also implies that the more perceived trialability, the sooner SMEs will adopt e-commerce.

In summary, three of the hypotheses were supported, namely, Hypotheses 1(perceived relative advantage), Hypothesis 4 (trialability) and Hypothesis 5 (observability). However, the regression model has less explanatory power compared to the previous work in other areas in which the five characteristics of innovation used in the regression model would explain 49-87% of the adoption of innovation. In this study, the regression model would explain only about 14% (Adjusted R^2 = .140) of SMEs' willingness to adopt e-commerce. The low explanatory power was also observed from the study conducted by Kendall et al. (2001), where the variables explained only 36% of the SMEs' willingness to adopt e-commerce. A possible explanation of this finding could be due to the role of other predictors which were excluded by the DIM. Several researchers have mentioned that DIM has some limitations in so far as applying it to the context of e-commerce adoption. Raymond et al. (2005), for example, highlighted that DIM needs to be enriched when innovation relates to complex technologies (such as e-commerce) and when innovations are adopted by organizations (instead of individuals). Nevertheless, the findings of this study still shed some light on e-commerce adoption by Malaysian SMEs as discussed in the following section.

DISCUSSION

One of the main findings of this study is that perceived attributes of e-commerce relate significantly to the adoption of e-commerce by Malaysian SMEs in the manufacturing sector. By adopting e-commerce, manufacturing SMEs can gain strategic advantage such as greater internal and external process integration, closer link with customers and other business partners, greater market penetration and expansion capabilities, richer information for decision-making, better competitive intelligence, and greater access to external resources and expertise that contribute to the development of small businesses (Jeffcoate et al. 2002).

The findings from this study show that perceived relative advantage is the strongest predictor for e-commerce adoption amongst Malaysian manufacturing SMEs. The relative high importance of this variable indicates that the benefits of e-commerce perceived by the SMEs have led them to adopt

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it or consider adopting very soon. This finding is very much similar to past findings in other countries (Kendall et al. 2001; Lertwongsatien 2004; Chong 2004). In fact, perceived relative advantage is one of the innovation characteristics that consistently found to be significant in various contexts. It appears that manufacturing SMEs in Malaysia are aware of the benefits of e-commerce to their companies and perceived that these benefits can motivate them to adopt e-commerce.

Another significant factor which may influence e-commerce adoption amongst Malaysian SMEs is observability. Observability was also found to be a significant factor related to the extent of e-commerce adoption by Australian SMEs (Chong 2004). The knowledge of the benefits of e-commerce is likely to be seen and understood if it is observable. In this study, since adoption of e-commerce relates to SMEs that conduct online transactions, not just those having web sites, these SMEs have seen some observable results when they were at the initial stage of just having the Internet presence. The confidence gained allows them to move forward to the next stage of e-commerce implementation. In addition, the significance of observability also implies that the willingness of SMEs to adopt e-commerce will depend on prior success stories. The negative relationship between the predictor and the willingness of e-commerce adoption implies that SMEs which tend to rely on observed results before making the decision are actually delaying the time to adopt e-commerce. This finding implies that a majority of manufacturing SMEs in Malaysia prefer to be later adopters rather than initiators of e-commerce.

Another variable which was found to be significantly related to e-commerce adoption by Malaysian manufacturing SMEs is trialability. A study on Australian SMEs also found trialability to be significantly related to e-commerce adoption (Chong, 2004). 'Trials' of e-commerce seem to be easier for SMEs to pursue due to inherent flexibility in organizational and managerial structure compared to the larger counterparts. However, 'errors' would be more risky and costly due to their limited resources and assets (Sadowski et al. 2002). In this study, this finding need to be interpreted with caution as only a single item is loaded on this factor, namely "awareness on the availability of government grants". The significance of relationship between trialability and SMEs' willingness to adopt e-commerce implies that the relevant government agencies such as SMIDEC, need to promote aggressively on the availability of grants ad other incentives as this would increase the probability for more SMEs to undertake e-commerce implementation.

It was found that complexity and compatibility were not significantly related to the adoption of e-commerce amongst Malaysian manufacturing SMEs. These findings are quite unexpected. The fact that most SMEs in the sample did not perceive complexity as a deterrent factor could be due to these manufacturing SMEs having substantial IT or Internet experience. As highlighted

by Raymond et al. (2005), most manufacturing SMEs were compelled to integrate technology as part of their manufacturing process, hence, their levels of IT experience are higher compared to firms in other industries. In addition, compatibility was not perceived as an important predictor for e-commerce adoption probably also due to the manufacturing context. In Malaysia, as in other countries as well, smaller manufacturers often act in a subcontracting capacity or in partnership with other firms within network enterprises. Some SMEs in the sample might have already involved in B-2-B type of e-commerce, hence, whether or not e-commerce is compatible with 'the company's policy' or 'organizational structure' were perceived as not important in predicting e-commerce adoption.

IMPLICATIONS & CONCLUSIONS

The study has implications for both research and practice. For the research, firstly, this study represents one of the earliest, to empirically test DIM for SME e-commerce adoption in the context of Malaysia. With the low explanatory power of the regression results, it is difficult to conclude that Roger's Diffusion of Innovation theory, widely applied in the United States and European countries, is also applicable in the Malaysian or Asian context. Secondly, while this study explores a number of important e-commerce adoption factors, future research could expand the variables to cover other aspects of the phenomenon.

For practitioners, this study highlights the importance of CEOs/managers' perception and knowledge on e-commerce. The results of the study show that SMEs with CEOs who perceive that e-commerce can offer relative advantage are more likely to adopt e-commerce. The government or relevant authority should focus on awareness and training programmes for the CEOs, as done in Singapore. As the findings also indicates that Malaysian SME owner/managers expect to see beneficial results of using e-commerce by others, more success stories should be publicised.

Despite some limitations, such as, the sample size and representing just the manufacturing sector, the study has shed some light on the importance of the perception of the small business managers on e-commerce adoption. Although the study focused on Malaysian SMEs, it may very well be applicable to other developing countries in the Asian region with similar context.

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