

SME e-readiness in Malaysia: Implications for Planning and Implementation

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Abstract

This study hoped to answer 2 main objectives. The first objective was to assess the level of e-readiness of SMEs in Northern Malaysia. The second objective was to investigate the factors contributing to the e-readiness of SMEs in Northern Malaysia. Questionnaires were distributed using a simple random sampling method to 300 SMEs in Penang, Kedah and Perlis. The findings of this study show that SMEs in Northern Malaysia are ready to go for e-business, e-commerce and Internet in general. The findings also showed that in general top management commitment and infrastructure and technology have significant impact on SMEs' e-readiness. However, human capital, resistance to change, and information security do not have significant impact or contribution on e-readiness in SMEs.

Keywords: *E-readiness, Small and Medium Enterprise, Infrastructure and technology, Human Capital, Information security concern, Resistance to change, Top management commitment, survey, Malaysia*

INTRODUCTION

World economic growth depends increasingly on information and communications technologies (ICTs) and the ability of countries and enterprises to collect, process, and use digital information. During the last few years, companies have been able to achieve and sustain competitive advantage for the most part by the role that Information Technology (IT) has played in propelling and accelerating the globalization of business. Researchers and practitioners have stressed that recent IT developments are changing and will continue to change the business arena in the near future.

Many see the Internet as a revolutionary technology that will alter the way business, commerce, medicine, science, communications, the law, politics, and government is conducted. Andrew Grove, the chairman of Intel Corporation, predicts that the Internet will

become so pervasive that in the future every business will be an Internet business or no business at all. Forrester Research, an Internet research firm, estimates that revenues in the Business to Consumer segment will grow from \$20 billion in 1999 to \$184 billion by 2004.

Also, the 1990s have witnessed the proliferation and hyper-growth of the Internet and Internet technologies, which together are creating a global and cost-effective platform for businesses to communicate and conduct commerce. Indirectly, Internet is enabling smaller businesses to gain the efficiencies and cost savings that once were afforded only to larger businesses. There is evidence that shows SMEs around the world are embracing e-business and e-commerce and spending increasing amounts on information technology in different regions. Research also shows that SMEs using the Internet to conduct business have higher revenues.

Internet is thus a new way of conducting, managing and executing business transactions using modern Information Technology. The Internet provides access 24 hours a day, seven days a week – any time anywhere. Thus, time and place are no longer the binding factors. In essence, the Internet is allowing businesses to enter niche markets at no additional cost (Kleindl 2000). There are 2 types of Internet component: e-business and e-commerce.

- Electronic business or e-business describes the use of electronic means and platforms to conduct a company's business. (Kotler 2003). Intranets are created to facilitate employees communicating with one another and to facilitate downloading and uploading information to and from the company's computers whereas extranets are set up with major suppliers and distributors to facilitate information exchange, orders, transactions, and payments. "E-business will change Asia more than it changes the

U.S.,” said Kristian Steenstrup, research director at Gartner. E-business plays an important role to help the company change the way of doing business. This would enable the company to engage in communication flows with local and overseas client and agents more cost effectively. E-business also improves processing and customer response time through e-mail, EDI, intranet and etc.

- Electronic commerce, also known as e-commerce, is more specific than e-business, it means that in addition to providing information to visitors about the company, its history, policies, products, and job opportunities, the company or site offers to transact or facilitate the selling of products and services online. (Kotler 2003). E-commerce is the process of buying and selling goods and services electronically with computerized business transactions using the Internet, networks, and other digital technologies. (Laudon and Laudon 2005). E-commerce (EC) builds on the structures of traditional commerce by adding the flexibility offered by electronic networks. Existing research points out that EC can offer readily discerned benefits in comparison to traditional environments through reduced transaction costs and search costs, more competitive product prices (Bakos 1991) and improved transaction efficiency (Srinivasan, Kekre and Mukhopadhyay 1994; Lee and Clark 1996).

E-business and e-commerce takes place over four major Internet domains: B2C (business to consumer) (Example: the use of e-business between an enterprise and a customer; e.g. a customer orders a CD-ROM online from an online music store), B2B (business to business) (Example: the use of e-business between two companies; e.g. a hospital pharmacy electronically orders a drug from a pharmaceutical supplier who then orders it electronically from a manufacturer), G2C (government to consumer) (Example: the use of e-business

between Government and consumers; e.g. a Government website is used by a consumer to acquire information about Government health services), and G2B (government to business) (Example: the use of e-business between Government and businesses; e.g. a small business submits its tax return online). (http://www.jma.com.au/ebus_evolution_definition.htm)

One of the most important factors to sustain a company's long-term business survival is constantly ensuring relevance and maintaining the competitiveness within the changing dynamics of doing business. The traditional way of doing business has been replaced by e-commerce and e-business is the solution being pursued by many highly profitable companies nowadays like Intel, Hewlet-Packard, Dell, General Electric and so on. Due to the impact of technology and Internet on the overall business transaction and communication environment, there has been considerable interest in understanding the degree of e-readiness (which measures the capacity of nations to participate in the digital economy) of Malaysian businesses. In addition, E-readiness of SMEs has been a topic of considerable interest due to the obvious impact the Internet may have on the economics of their business.

Definition of SMEs in Malaysia

The most widely used definition of the Malaysian SMEs is the one by the Ministry of International Trade and Industry (MITI) (Hashim 2000b):

1. Small sized firms: A firm with less than 50 full-time workers OR an annual turnover of less than RM 10 million.
2. Medium sized firms: A firm with 50-150 full-time workers OR an annual turnover in the range of RM 10 million to RM 25 million.

Research Problem

Over the years, Malaysia has transformed from a commodity-based producing nation to being a manufacturer of industrial products. When the economic slump hit Malaysia in 1997, many companies suffered tremendous losses with the exception of the small and medium industries (SMEs). At present, SMEs are recognized as the backbone of the country's economy. SMEs form a significant portion of the manufacturing and services sector. As at December 2003, 89.8 per cent of the more than 20,000 companies recorded in the manufacturing sector were SMEs. Meanwhile, SMEs comprise 98.8 per cent of the close to 193,000 enterprises in the services sector. (http://www.necinfrontia-ap.com/news_20040805.htm). With the advent of the ASEAN Free Trade Area (AFTA) 2003, WTO and globalization, SMEs need to strengthen their resilience to the challenges and to explore the opportunities in this new economic era (SMIOSS, 2002).

[Insert Table 1 about here]

SMEs are so numerous and productive that their total economic output exceeds those of large companies. Therefore, in order to determine their relative economic importance, it is essential to measure the percentage of the economy's total output and service (GDP) that come from SMEs (Hashim 2000a; 2000b).

[Insert Table 2 about here]

The Ministry of International Trade and Industry (MITI) and its Agencies, the Malaysian Industrial Development Authority (MIDA) and the Small and Medium Industries Development Corporation (SMIDEC) have been tasked to look into the development of

SMEs in the services sector. To expand the coverage of the support programmes in the services sector, SMIDEC has been given an allocation of RM14.4 million. The four sectors that have been targeted are distributive trade (wholesale and services), logistics, professional services and manufacturing related services. (<http://www.bnm.gov.my>)

As the SME sector of Malaysia constitute the majority of business activities in Malaysia and their contribution to economic growth is significant, various efforts have been channeled to ensure that they remain globally competitive. SMEs are revolutionizing their business practices but need to do so at a faster rate in order to adjust and cope with the many uncertainties and rapidly changing conditions. They must maintain their competitive edge, adopt new models of growth, develop a global network of product exchange and establish wider international network.

Involvement in a networked economy is one of the new challenges that are faced by SMEs today. Many SMEs are left behind in the race towards a networked economy. While big organizations can generally muster the resources needed for the networked economy, the challenge is in getting SMEs on board the Internet agenda by working around their resource and skills shortages. If SMEs get left behind in the new economy, the whole country, Malaysia, gets left behind.

The decision makers particularly the chief executive officers and chief financial officers in most organizations have difficulties in evaluating and adopting Internet strategies. There are many factors affecting decision-making in the adoption of Internet, and knowing the organization's level of e-readiness can help managers make better decisions. This study will examine various factors that contribute to the e-readiness of SMEs and derive a model that can be used as a basis for SMEs in Malaysia to assess their organization's capacity to

participate in the networked world and make the necessary preparations to involve in a networked economy.

Research Objectives

A wide range of studies on E-readiness show the fundamental uncertainties and ambiguities in theory and in practice. To date, such studies lack robust foundations and empirical analysis, and provide little guidance for business and government – thus obscuring the realities as well as the opportunities. Furthermore, all the E-readiness studies use country as the unit of measurement. Current e-readiness indices assume a fixed, one-size-fits-all set of requirements, regardless of the characteristics of individual countries or the demands of specific applications. Moreover, most e-readiness studies provide little information on how their indices were constructed, or how they might be tweaked to analyze particular e-business opportunities (Siegel, Haghseta and O'Donnell 2002).

This research is intended to study factors contributing to E-readiness of SMEs operating in Northern Malaysia. This research paper will answer two research questions:

1. What is the level of E-readiness of SMEs in Northern Malaysia?
2. What are the factors that contribute to the E-readiness of SMEs in Northern Malaysia?

LITERATURE REVIEW

Firms such as Cisco Systems, Dell Computer and General Electric report impressive payoffs by making the Internet a key element in their strategies and business models, and by transforming their “brick-and-mortar” operations into e-business organizations. Cisco Systems and Dell Computer report in excess of 250% return on invested capital and over USD 650,000 in revenue per employee from their e-business operations. They also have the highest gross profit margin in their respective industries. From a survey finding of over 400 information technology managers worldwide, relative to larger firms, smaller businesses who make effective use of Internet opportunities may also find that they are more innovative, faster in responding to environmental demands, and better able to quickly change or adapt business models to gain competitive advantage (Engler 1999). As a result, traditional firms, especially small organizations, are under increasing pressure to follow suit, and to achieve the often-cited benefits of e-business.

According to the Small and Medium Industry (SMI) Association of Malaysia, there are around 100,000 SMEs in the country (manufacturing and service) that makes up some 91 percent of the country’s industrial establishments. For SMEs, which plays an important role in Malaysia, to increase their competitive advantages against larger organizations, the management in these firms is faced with the task of identifying opportunities, and assessing their e-readiness and justifying Internet technology investments. “The longer Malaysia's SMEs wait, the further they will be left behind as e-business and e-commerce begins a transformation in the way business is conducted”, said SMI Association of Malaysia president Looi Teong Chye.

Akkeren and Cavaye (1999) have identified the factors influencing IT adoption are similar to the factors influencing e-business and e-commerce adoption (particularly in small business), thus, some of the factors of successful adoption of IT in SMEs from a study by Fink (1998) will be used as the independent variables for this research. The factors include in house IT expertise (human capital), availability of IT (infrastructure and technology), IT implementation (top management commitment) and organizational culture (resistance to change).

E-readiness

APEC defines e-readiness as the degree to which an economy or community is prepared to participate in the digital economy (APEC 1999). A definition by McConnell on e-readiness is the capacity to participate in the global digital economy (McConnell 2000). McConnell's definition of e-readiness lacks descriptive details, but the basic meaning points to the capacity to participate in digital way of doing business.

In the study of Hartman, Sifonis and Kador (2000), net readiness is measured as a company's preparedness to exploit the enormous opportunities in the e-economy landscape. Grant (1999) mentioned in his maturity model where a business is "ready" to implement e-business and e-commerce strategy, with the business plans and expectations clear, with no insurmountable obstacles impeding progress, and have identified any needed partners or professional support. Another report by Parker (2000) described e-readiness as "preparedness" to operate in an e-business and e-commerce marketplace.

The success of the Internet initiatives of a firm or enterprise depends not only on its own effort to digitize its value chain, but also on the readiness of its customers, supplier and

trading partners to engage in electronic interactions and transactions (Barua, Whinston and Yin 2000a; 2000b). Successful e-readiness practice requires readiness on the part of all players in the value chain, and companies that adopted e-commerce or e-business must invest in increasing their trading partners' readiness (Barua, Whinston and Yin 2000a; 2000b).

E-commerce application includes the use of many different types of online facilities to do business: order registration, electronic advertising, electronic billing system, electronic marketing, online delivery status and tracking and customer services support. E-business applications also include the use of many different types of online facilities to communicate and coordinate: production planning, JIT management, scheduling, outsourcing and other business operation process.

The next section will discuss the various factors that drive e-readiness.

Infrastructure and Technology

Internet is a collection of client/server computers and infrastructure that spans the earth. E-commerce and e-business simply cannot function without adequate telecommunications network and Internet infrastructure. Only users or enterprises who are able to access these networks, though proprietary or shared access devices or terminal/kiosks, are able to participate in e-commerce or e-business, and the larger number of users with network access, the greater the potential benefits of e-commerce and e-business.

There are six components to support e-business readiness as suggested by Jutla, Bodorik and Dhaliwal (2002) which are:

1. knowledge and innovation process-based economy;

2. e-government leadership;
3. regulatory, trust, and financial infrastructure;
4. content infrastructure (including content management process);
5. human infrastructure including skills distribution network; and
6. communications and information systems infrastructure and access.

However, the foundation for all e-business readiness is based on the modern technologies and the access to those technologies in the areas of communication and information. Included in communications and information systems infrastructure are networking and computer hardware, underlying application software technologies for e-business applications, and applications representing automated business processes. (Jutla, Bodorik and Dhaliwal 2002). IT infrastructure is a major business resource and a potential source for attaining sustainable competitive advantage (Keen 1991). To be a player in virtual marketplace, a large investment in personnel and infrastructure is required (Kleindl 2000).

Insufficient access to appropriate information infrastructure of suitable quality, and at reasonable cost, is a fundamental barrier to the SMEs adoption and use of e-commerce and e-business (APEC 1999). The information infrastructure required for e-commerce and e-business involves dependable telecommunication links and Internet services being available to firms such as SMEs. The APEC study of 1999 showed that firms with higher quality of telecommunication access might be using this capacity to become more advanced, while other firms with limited quality access view this factor as a critical barrier to their adoption of e-commerce and e-business.

As reported in The STAR (August 28 2002) International Data Corporation (IDC) Malaysia country manager Selina Chin commented that the Internet infrastructure in Malaysia is insufficient to sustain an Internet economy. She further pointed out that the bandwidth issue needs to be resolved for e-commerce to really take off. She also reported that the majority of the Malaysian companies are still using dialup Internet access, not enough are using ISDN or leased line.

Most of the nation wide e-readiness assessment tools are using infrastructure and technology as one of the assessment criteria. Therefore, to assess an organization's level of e-readiness, infrastructure and technology as criteria should not be omitted from the research.

Human Capital

Human capital refers to the knowledge and skills of a firm's workforce. From the human capital perspective, employees are viewed as a capital resource that requires investment. As the dynamics of competition accelerate, people are the only sustainable source of competitive advantages. Finding the human capital necessary to run an Internet project effectively is a difficult task. A lot of IT specialists, especially Web-based expertise, are needed for an organization's e-readiness. In order to achieve the organizational vision of being involved in the networked economy, the organization need to create and nurture a well-developed human capital base, where skills and work ethics are of highest quality and will be self-generated is needed. In this regard, most of the organizations have invested heavily on the human capital and will continue to do so in the future towards the creation of greater and larger pool of human capital.

Organizations with more IT experience or greater IT already in use are more likely to adopt IT (Fink 1998). Staff involvement in IT development and IT training carried out had a positive effect on IT adoption (Doukidis, Smithson and Lybereas 1994). The lack of sufficient online procurement experts within the company is one of the biggest hurdles many companies face in implementing online procurement systems (Attaran 2001). However, National Computer Board assessed the state of e-commerce in all of the country's eight industry sectors, Malaysia like in Singapore, very few SMEs have trained IT personnel and this function is often undertaken by an accountant or the owners, who may not welcome a "diversion" from their core activities. Thus, SMEs are usually regarded 'poor' in human, financial and material resources. This caused them to rely more extensively than larger organization on external help (Yap, Soh and Raman 1992). However, the finding from the studies on the factors important to SMEs when adopting IT appears to contradict previous studies which indicated that small businesses largely rely on external expertise and resources when computerizing because of lack of internal IT management and skill (Fink 1998). Therefore, human capital of an organization is one of the important factors contributing to SMEs e-readiness.

Information Security Concern

Security threats are growing both in scope and sophistication; therefore, organizations of all types and sizes will continue to strengthen their defenses against these threats. While some will rely on internal systems and resources, others may lack the training, skills and resources to secure their IT infrastructure. In most cases, it is the MNCs that have the expertise and resources to secure their infrastructure while the SMEs, most often depend on vendors for advice and assistance. Even SMEs realize the importance of security, but they are often deterred by the cost associated with it.

"The Internet was built for availability, and not so much for security," observed Angu Selvan, Head of Internet Technology, Nokia Internet Communications. To most consumers, the issue of security and privacy over the Internet is the most overwhelming barrier facing the adoption of e-commerce (Norazah 2001). Widely published security issues on the Internet, where hackers have accessed personal financial information being sent electronically, have done little to boost consumer confidence in the Internet as a conduit for commerce (Goodwin 1991). There is also a great concern, among the Internet users, regarding the security of financial information transmitted over the Internet (Gupta 1995). In general, consumers tend to be more comfortable providing sensitive information in a realm where they can see with whom they are dealing, revisit the physical location of the business if necessary, and exert a perceived amount of control over the situation (Janes et al. 1997). Yuliharsi (2004) studied the potential of Internet shopping among students of a university in Penang, Malaysia and found that users were not convinced with the method and security of payment through the Internet. Tan and Teo (1998) found e-commerce to be a very convenient way to do business. However, many had nagging doubts about the security of transactions (Dr Sankaran 1999).

Comparison between the factors influencing the adoption decision of e-commerce amongst individuals and organizations demonstrated that the difference is only the focus of decision makers (Pin, Jantan and Nasirin 2000). Besides, three factors which have been cited by many (Ainin and Rohana 2000) of a great concern in the implementation of e-commerce are security, privacy and property protection. The findings of the research conducted on SMEs in Australia (Lawrence et al. 1998) illustrated that electronic security is the single major barrier to e-commerce. Therefore, information security that always concerned by Internet user should be a fundamental factor for a SMEs organization to be e-ready.

Organizational Factors

Resistance to Change

One of the well-documented findings from studies of individual and organizational behavior is that organizations and their members resist changes. (Robbins 1994). McNurry (1973) have quoted “Industrial progress finds one of its greatest handicaps in the frequent resistance of both management and workers to change of any sort”. Traditional management thinking views resistance as the enemy (Waddell and Sohal 2002).

Change brought about by technology poses significant challenges to small business management (Fink 1998). Internet can result in a fundamental and radical change in the manner in which business is done. Therefore, resistance to change from individual and organizational may develop. The following two examples illustrate resistance to change of e-commerce in Europe:

- “Fulfilling its promise won’t come easy. The region must build eCommerce networks to help overcome social fears and resistance to change.” [Torriss 1999].
- “...the biggest threat, I believe, is a cultural one. For, despite deepening pockets of technical excellence and proof of success in key areas, we remain risk-averse, not willing to embrace wholeheartedly the entrepreneurial spirit that is taken for granted across the Atlantic” [Ellis 1999].

The organizations should understand the reasons for the resistance to overcome the problem when involved in networked economy that will facilitate e-commerce adoption.

Top Management Commitment

Management commitment to technology acquisition, application and exploitation must be seen as well as felt through the organization. Top management must be directly involved in technology-related decision even if there are technically qualified staffs in the organization. A "hands-off" approach must be avoided. Mechanisms to ensure integrated decision-making must be put in place (Tengku Mohd Azzman, Karthyeni & Roslan Ahmad, 1998).

As an organizational factor, top management commitment is required to ensure successful adoption of the Internet technology. The importance of leadership to the change management process is highlighted by the fact that change requires creating a new system and then institutionalizing the new approaches. Management needs to monitor employees' response to technological change, and institute appropriate action programs for IT acquisition, implementation and operation (Fink 1998). For Example, the CEO has been shown to play a significant role in the successful adoption of IT in small business (Thong and Yap 1995). According to the 1998 e-commerce India Survey Report, senior level support and budget allocation were given due weightage as actions taken for integration of e-commerce technologies with existing processes. The survey also reported that IT Department and Executive Committee are the biggest sponsors.

RESEARCH DESIGN

Research Framework

Figure 1 provides the research framework used in this study. E-readiness of SMEs is the dependent variable, while infrastructure and technology, human capital, information security and organizational factors are the independent variables. The organizational factors considered in this study are resistance to change and top management commitment.

[Insert Figure 1 about here]

Hypotheses

Infrastructure and technology is a basic tool for SMEs to be involved in networked economy. Without the tool nothing can be done. Based on the case study from Mehrtens, Cragg and Mills (2001) using four firms in IT industry, the evidence from the study supported the view that organizations that have high levels of information technology are more likely to adopt the Internet. Thus, this hypothesis predicts that infrastructure and technology are positively related to the e-readiness of SMEs.

H₁: Infrastructure and technology will be positively related to the e-readiness of SMEs.

People are assets to an organization. People with the knowledge of Internet, e-commerce and e-business play a more important role in SMEs which plan to be involved in networked economy. Kwon and Zmud (1987) asserted that successful information system (IS) implementation occurs when sufficient organizational resources such as sufficient developer and sufficient technical skills are available. Therefore, the human capital can have a lot of impact on the e-readiness of SMEs and this hypothesis predicts that human capital, which is internal staff's expertise and skills, is positively related the e-readiness of SMEs.

H₂: Human capital (internal staff's expertise and skills) is positively related to the e-readiness of SMEs.

Most people have doubt about making monetary transaction or transfer confidential information through the Internet. To be ready to involve in a networked economy, SMEs must have installed some hardware or software that can enforce the information security.

Studies done by Sulaiman and Jani (2001) have shown that security issues are among the main barriers to the implementation of e-commerce and e-business. The organizations were reluctant to use e-commerce as they felt that the transactions conducted electronically were open to hackers and viruses, which are beyond their control as well as security measures that were implemented to safeguard on-line payment transactions. Therefore, we hypothesize that information security will be negatively related to the e-readiness of SMEs.

H₃: Information security concerns will be negatively related to the e-readiness of SMEs.

Participating in the networked economy will bring a lot of changes to an organization. The changes might be the change in business process or business model that requires careful attention from top management. Sandkull (1980) suggests that resistance to change may yield an incomplete implementation of the technology and may limit the benefit associated with introducing the technology. SMEs that are likely to adopt IT will most often have a CEO who has a positive attitude towards IT adoption, who is innovative and who is knowledgeable about IT (Brancheau and Buckland 1996). Resistance to change will have negative relationship with e-readiness of SMEs.

H₄: Resistance to change will be negatively related to the e-readiness of SMEs.

Research indicates that top management support is a good predictor of success of new IT such as Internet (Ives and Olson 1984). For Internet adoption if the SMEs manager is not convinced of the technology and does not provide support and resource, it is unlikely to be adopted (Dandridge and Levenburg 2000). Thus, top management commitment is hypothesized to be positively related to the e-readiness of SMEs.

H₅: Top management commitment will be positively related to the e-readiness of SMEs.

METHODOLOGY

The target population for this study consists of SMEs located in the Northern Malaysia, which includes Penang, Kedah and Perlis. This study requires the respondent to have appropriate understanding and exposure to Internet transaction functionalities and capabilities. Simple random sampling was used to sample from the SMEs list provided by Small and Medium Industries Development Corporation (SMIDEC) website under the “Penang, Kedah, Perlis” directory and the Penang Development Corporation (PDC) factory list. The number of sample subject is targeted at around 300.

A ten page questionnaire was prepared to be completed by respondents. Several questions around the key research hypothesis were self-constructed with guidance from experts in the area. The questions were designed based upon definitions of variables, some questions were borrowed from TRI (Technology Readiness Index) proposed by Parasuraman (2000) and other previous studies. The questions borrowed were modified to match the research area.

Data collection was done by sending out questionnaires either electronically, through friends and by mail. The respondents for this study are the decision makers or IT personnel influencing decision making in investment in computerization projects. All the respondents are expected to be aware of company’s IT related information as SMEs with number of employees less than 150 are better versed about and exposed to the company environment and systems. A self-addressed, stamped envelope was included to facilitate the return of the completed questionnaire.

RESULTS

A total of 300 questionnaires were distributed and only 80 usable responses were received. As such the response rate is 27% which can be considered high for a mail survey. The response rate of 27% is actually higher than the normal response rate of 10-20% using the same method in Malaysia. As the respondents for this study are the decision makers or IT personnel influencing decision making in investment in computerization projects they are known to be less likely to respond to mailed questionnaires than people in the general population (Hunt and Chonko 1987). Thus subject to the limitation of the low response rate, the data can be useful to shed light on the issue that is important in this study.

The profile of the respondents and the organizations are presented in Table 3 and 4.

[Insert Table 3 about here]

[Insert Table 4 about here]

As suggested by Zou et al. (1997), owing to the lack of comparable data from the non-responding firms, direct comparison of the responding and non-responding firms was not possible. We used the wave analysis method with the Student's t-test as the next best approach to compare between the early and late replies as suggested by Armstrong and Overton (1977). The wave analysis method assumes that those who respond less readily are more like non-respondents. (Zou et al., 1997). They suggested using the t-test procedure under the assumptions of both equal and unequal group variances. In the t-test analysis, we found no between-group mean differences at the 5% level for any of the variables in the study. Thus, it may be concluded that non-response bias was not of particular influence in this research. (Skarmeas, Katsikeas and Schlegelmilch, 2002).

Goodness of Measures

E-readiness Measurement

The 21-item scale measuring the e-readiness of the SMEs (dependent variable) was submitted to a principal components analysis with varimax rotation. All the items have value of Measures of Sampling Adequacy (MSA) more than 0.5. Besides, Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.86 and Bartlett's Test of Sphericity is significant with value 0.00.

Based on the rotated component matrix, out of the 21 items, ten items (question 2, 3, 4, 5, 7, 9, 10, 11, 12 and 21) were dropped as they have high cross loadings. Four factors met the selection criteria of eigenvalues greater than 1.0, explaining a total of 74.95% of the variance. All the items selected had factor loadings greater than 0.50. However, factor 3 has been dropped because it had only one item (question 19). Thus, we have retained only three factors with 10 items for the e-readiness measurement with a total variance explained of 67.27%. (see Table 5)

[Insert Table 5 about here]

Reliability of the Measures

Table 6 presents the reliability coefficients for the main variables of the study.

[Insert Table 6 about here]

The reliability analysis, assessed with Cronbach's Alpha reliability test, was carried out in order to ensure the internal stability and consistency of the items used in each variable. The values ranged from 0.68 to 0.94 and can be considered to be reliable.

The descriptive statistics of the composite variable are shown in Table 7.

[Insert Table 7 about here]

Pearson Correlation Analyses

As shown in Table 8, there appears to be some degree of correlation between the dependent variable (with 3 factors) and independent variables. However, there were no correlations exceeding 0.70. If the correlation is 0.75 and above, for the independent variables then there might be a possibility of multicollinearity when the regression analysis is employed. Thus we can conclude that there is no problem of multicollinearity.

[Insert Table 8 about here]

Hypotheses Testing

Table 9 presents the result of the regression analysis. Infrastructure and technology ($\beta= 0.206$, $p< 0.05$) and top management commitment ($\beta= 0.473$, $p< 0.01$) were found to be positively related to digital technology readiness. As for e-commerce readiness it was the same case as infrastructure and technology ($\beta= 0.115$, $p< 0.05$) and top management commitment ($\beta= 0.557$, $p< 0.01$). For the digital technology readiness and e-commerce readiness, top management commitment was the most influential driver indicating the role of top management in gearing the company towards network readiness.

For e-business readiness, top management commitment did not seem to contribute whereas infrastructure and technology ($\beta= 0.311$, $p< 0.05$) was the only significant driver. This goes

to show that for e-business readiness the infrastructure and technology availability was the significant predictor.

Thus H1 of this study is fully supported whereas H5 is partially supported.

[Insert Table 9 about here]

DISCUSSION AND CONCLUSION

Discussion of Study Findings

Based on the overall e-readiness, the responding firms generally are not very sure about their readiness in adopting e-commerce, e-business and Internet. An overall e-readiness mean of 3.44 explains this situation. Zooming into the components of e-readiness, from Table 7 the mean of 3.29 and 3.28 suggests that in general SMEs in Northern Malaysia have mixed feelings about their readiness in digital technology and e-commerce respectively. Nonetheless, from the mean of 3.75 indicates that SMEs in Northern Malaysia have higher readiness in terms of e-business readiness.

The regression analysis results show that infrastructure and technology, and top management commitment variables have significant impact on SMEs' e-readiness. Human capital, information security, and resistance to change do not demonstrate any significant effect on the e-readiness of SMEs.

Digital Technology Readiness

Management support has been found to positively and directly influence digital technology readiness of SMEs. This is consistent with the research of Yap, Soh and Raman (1992), Cragg and King (1993), and Igbaria et al. (1997) who found that the involvement of management was positively associated with the success of IS implementation and computer technology acceptance. Management support has been defined as the perceived level of general support offered by top management in SMEs (Igbaria et al. 1997). The more involvement and support demonstrated by top management, the higher the digital technology readiness.

The finding from this study also showed that infrastructure and technology positively influences the digital technology readiness of SMEs. This is consistent with the works done by previous researchers. Akkeren and Cavaye (1999) suggested that organizational readiness, as defined by the level of technology currently incorporated into business processes in the firm; this will likely affect the SMEs adoption of new technology such as the Internet technology. The more up to date and the higher the availability of infrastructure and technology, the more ready the company is in terms of digital technology.

E-commerce Readiness

The finding from this study indicates that the result for the digital technology is same as e-commerce readiness. Infrastructure and technology positively influences the e-commerce readiness of SMEs. This again is consistent with the previous studies based on the same reasons as given for the digital technology readiness. Barua, Whinston and Fin's (2000a; 2000b) study suggests that system integration enables firms to react, innovate, and make continuous improvements by identifying and sharing information across products, services, and business unit which enhance the organizational knowledge and readiness in adopting e-commerce. Thus, the more up to date and the higher the availability of infrastructure and technology, the more ready the company is to adopt e-commerce. Besides this, top management commitment also positively influence e-commerce readiness of SMEs thus we can conclude that the higher the involvement and support demonstrated by top management, the higher will be the e-commerce readiness.

E-business Readiness

The result of the study shows that SMEs are higher on e-business readiness. Infrastructure and technology availability was the significant predictor of e-business readiness. The findings

support the work of Mehrtens, Cragg and Mills (2001) who found that organizations that have high levels of information technology are more likely to adopt the Internet.

Hypotheses not Supported

Human capital was found not influencing e-readiness of SMEs, which is consistent with previous studies such as DeLone (1988) who found that the availability of internal technical support as mainly for training purposes and did not result in greater IS success in SMI. One of the possible reasons could be the effectiveness of external support. The variety of engagements and support work done by external vendors and consultants may have given them the exposure and experience which have not been available to many internal support group to offer (Thong and Yap 1994). Another possible explanation may have been the lack of financial resources. Thus, there has been no priority for SMEs to setup internal IT support group, instead they largely rely on external expertise and resources when computerizing.

The result of study shows that confidence of SMEs in the information security does not have significant effect on the e-readiness of SMEs in Northern Malaysia. Once the information security feature is installed, the confidence level of the information security technology would not play an important role on e-readiness. The study by APEC (1999) showed that the level of relative concern with security appeared to decrease as firms become more advanced and gain a better understanding of security issues and the appropriate technologies to address them such as encryption.

SMEs aim to adopt e-commerce, e-business and Internet technology so that it will bring significant change to their performance. Davenport et al. (2001) stated that over 62 percent of managers agreed that organizational and cultural factors form the greatest barrier in achieving

significant return upon their data-to-knowledge related investment. However, the rejection of the hypothesis that resistance to change negatively influences the e-readiness of SMEs, is not consistent with general studies done before. In the SMEs business environment since owner or manager is the best person who understands the critical success factors and payoffs of investment, he or she plays important role in ensuring IS success (Jantan, Ramayah and Chin 2001). Therefore, once the owner makes the decision to embark towards the e-economy, the employees' resistance to change is no more an issue.

Implications

The findings suggest several general implications. This study enlightens us about e-readiness of SMEs in Northern Malaysia. As indicated by Chee (1986), the technology used by small firms is often outdated. According to Chee (1986), some small firms do not trust new technology while others are not able to afford it. He further concluded that many small firms rely on traditional technology which, in many cases is inefficient. The study by Jan, Jamaluddin and Shaari (1990) also indicated that small businesses are unable to upgrade their technology and become innovative because they employed traditionally low level technology and have limited accessibility to new technology. The researcher pointed the other factors include lack of information, inadequate in-house expertise, and financial constraints. However, from the findings from this study showed that SMEs are ready to go for e-business, even though inadequate infrastructure and limited application of new technology have been identified as weakness for SMEs (Hashim and Wafa 2002). In order for the entrepreneur of SMEs to compete successfully in the dynamic environment, they should be more involved in the networked economy based on their readiness to adopt e-business. In summary, SMEs are more ready to adopt e-business, while the readiness for digital technology and e-commerce can be improved.

The findings also implied that infrastructure and technology of SMEs positively increases the e-readiness. In order to accelerate e-readiness, SMEs must invest in IT resources, strong support from the top management, coupled with a good business process such as right expenditure and allocation of budget spending for IT infrastructure, hardware and software are some of the crucial items that will clearly increase the e-readiness.

The findings also implied that the commitment of top management will be able to increase the e-readiness. This could be done through top management's active participation, motivation, and demonstration of eagerness to see that his employees are involved in the networked economy. This includes the top management support of initiatives for internet technology application, top management's views on the internet technology application as a strategic tool, sufficient management commitment to apply the internet technology, top management awareness of the benefits and providing necessary support, help, hardware and people resources to adopt and implement the latest system available in the market.

Among all the factors contributing to e-readiness of SMEs, the most significant factor is infrastructure and technology. This study helps narrow the focus on where the SMEs should prioritize in implementing the e-commerce, e-business or Internet applications. The study also helps provide better insight to the government as to which are the priority areas to focus on and the strategy to create more positive e-readiness among the SMEs.

Limitations of Study

The scope of study is limited to manufacturing and non-manufacturing companies located in Northern Malaysia. The responses received were mostly from companies located in Penang

with a few from Kedah. The limited number of companies engaged in this study may raise a concern on representativeness of the sample. Only 5 independent variables were selected to be studied. Interpretation for this model has to be made with caution because there could be other unknown factors contributing to the remaining unexplained percentage. These unknown factors could be organizational characteristics and manager's past experience. Future studies may look into these factors.

Suggestions for Future Research

Future research in this area should also replicate this study, with an extension to all industrial zones in all the states of Malaysia. Larger sample size and inclusion of all industries would increase the external validity of these findings and may be used as a general guideline for evaluating effective e-readiness strategy. As there are other factors that are not considered, future studies should consider other factors, for example the business strategy, organizational characteristics, managers past experience, and managers' characteristics. Perhaps future study should also focus on specific competencies, attributes and characteristics of the users in relation to their roles. In addition, focusing on the technology-savvy culture as a variable will be interesting to note too. Besides, other factors could also be employee's past experience, funding support to the SMEs, issues specific to a particular industry, maturity and incentives in the usage of telecommunication infrastructures, political, legal and social.

CONCLUSION

The overall e-readiness suggests that SMEs in Northern Malaysia are ready to embark on the e-business journey. However the readiness to adopt e-commerce and digital technology can still be improved. The findings of the study also showed that in general infrastructure and technology has impact on SMEs' e-readiness. Top management commitment has the most

significant impact on SMEs e-readiness. However, human capital, resistance to change, and information security do not have significant impact or contribution to e-readiness of SMEs. Further studies are needed to refine this model so that we can have a better understanding and tool to measure the e-readiness of SMEs.

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Table 1: SMEs in Malaysia

SMEs as a percentage of total manufacturing firms	
Year	Percentage of Total Manufacturing Firms
1963	99.6
1968	99.0
1981	97.7
1985	64.0
1995	84.0
1996	86.0
1999	91.1
2000	92.0

Source: Chee (1986) and The National Productivity Corporation (NPC) (1996)

Table 2: SMEs Contribution in Malaysia

SMEs contribution to GDP	
Year	Percentage of Contributions to GDP
1991	20 (RM4.3 billion)
2000	40
2020	50

Source: Ministry of International Trade and Industry (MITI)

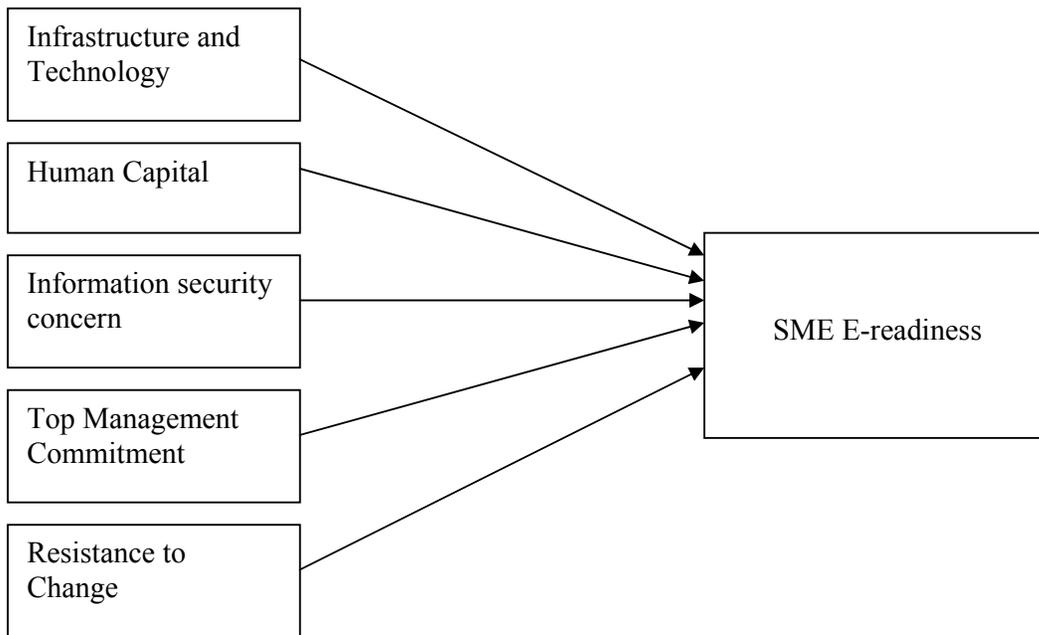


Figure 1: Research Framework

Table 3: Respondents Profile

Variable	Category	Respondents	
		Number	Percentage
Position	Senior Management	23	28.75
	Middle Management	34	42.50
	First Line Management	23	28.75
Job Function	Information Technology	23	28.75
	Finance/Accounting	6	7.50
	Human Resources	5	6.25
	Sales/Marketing	6	7.50
	Customer Service	6	7.50
	Administration/Owner	18	22.5
	Operation	10	12.5
	Others	6	7.50

Table 4: Organization Profile

Variable	Category	Respondents	
		Number	Percentage
State	Perlis	0	0.00
	Kedah	5	6.25
	Penang	75	93.75
Organization Type	Manufacturing	38	47.50
	Non-manufacturing	42	52.50
Number of Employees	1-50	46	57.50
	51-100	19	23.75
	101-150	15	18.75
Organization Size	Small	46	57.50
	Medium	34	52.50
Average profit level (profit over sales)	1% or less	7	8.75
	2% - 5%	17	21.25
	6% - 10%	28	35.00
	11% - 15%	13	16.25
	Above 15%	15	18.75
Annual growth (sales) rate	1% or less	10	12.50
	2% - 5%	29	36.25
	6% - 10%	22	27.50
	11% - 15%	11	13.75
	Above 15%	8	10.00

Table 5: Results of the Factor analysis

E-readiness	Factors			
	1	2	3	4
<u>Digital Technology Readiness</u>				
Ready to use digital technology for managing production planning		<u>0.89</u>		
Ready to use digital technology for inventory management		<u>0.87</u>		
Ready to use digital technology for group collaboration		<u>0.82</u>		
Ready to use digital technology for scheduling		<u>0.88</u>		
Ready to use digital technology for outsourcing activities		<u>0.77</u>		
<u>E-commerce readiness</u>				
Ready to receive purchases from customers through the Internet		<u>0.59</u>		
Ready for online selling to customers via Internet		<u>0.78</u>		
Ready to offer customer services via Internet		<u>0.82</u>		
<u>E-business readiness</u>				
Customers are ready to engage in electronic interactions				<u>0.65</u>
Suppliers are ready to engage in electronic interactions				<u>0.92</u>
<i>My customers are ready to engage in electronic transactions (e.g. making payment electronically)</i>				<u>0.67</u>
Eigenvalue	10.8	2.20	1.61	1.11
Percentage of Variance	51.5	10.5	7.67	5.29

Note: The item in italics was dropped because of a single item

Table 6: Reliability of the measures

Variable	Number of Questions	Cronbach's Alpha
Digital Technology Readiness	5	0.94
E-commerce readiness	3	0.85
E-business readiness	2	0.68
Infrastructure and Technology	7	0.92
Human Capital	3	0.94
Information Security Concern	6	0.83
Resistance To Change	9	0.90
Top Management Commitment	7	0.94

Table 7: Descriptive Statistics of the main Variables

Variable	Mean	Standard Deviation
Overall E-readiness	3.44	0.70
Digital Technology Readiness	3.29	0.98
E-commerce readiness	3.28	0.89
E-business readiness	3.75	0.82
Infrastructure and Technology	3.08	1.03
Human Capital	3.26	1.14
Information Security Concern	3.14	0.75
Resistance to Change	3.63	0.83
Top Management Commitment	3.61	0.82

Table 8: Intercorrelations of the study variables

Variable	1	2	3	4	5	6	7	8
1. Digital Technology Readiness	1.00							
2. E-commerce readiness	0.56**	1.00						
3. E-business readiness	0.20*	0.28*	1.00					
4. Infrastructure and Technology	0.54**	0.62**	0.25*	1.00				
5. Human Capital	0.20*	0.34**	0.23*	0.46**	1.00			
6. Information Security Concern	-0.09	-0.21*	-0.16*	-0.28*	-0.46**	1.00		
7. Resistance To Change	-0.28*	-0.35**	-0.24*	-0.36**	-0.60**	0.49**	1.00	
8. Top Management Commitment	0.60**	0.65**	0.26*	0.63**	0.43**	-0.23*	-0.43**	1.00

Note: **p<0.01; *p<0.05

Table 9: Multiple Regression Analyses results

Independent Variables	Standardized Beta		
	Digital Technology Readiness	E-commerce Readiness	E-business Readiness
Infrastructure and technology	0.206*	0.115*	0.311*
Human Capital	0.109	-0.087	-0.050
Information Security Concern	-0.201	-0.050	-0.087
Resistance To Change	-0.01	-0.022	0.017
Top Management Commitment	0.473**	0.557**	0.056
R square	0.419	0.418	0.101
Adjusted R square	0.375	0.374	0.074
F value	9.647**	9.493**	2.35*

Note: **p<0.01; *p<0.05