Information Communication Technology (ICT) Adoption Among SME Owners in Malaysia

Junaidah Hashim
Associate Professor
Department of Business Administration
Faculty of Economics and Management Sciences
International Islamic University of Malaysia
Jalan Gombak, 53100 Kuala Lumpur, Malaysia
junaidahh@iiu.edu

ABSTRACT

This paper examines the extent of information communication technology (ICT) skills, use, and adoption among owners of small and medium enterprises (SMEs) in Malaysia; identifies innovation characteristics and adopter categories among the owners; and establishes the relationship among these various constructs. The authors surveyed 383 SME owners, using a survey instrument developed from the constructs used in the diffusion of innovation theory. The findings show that the level of ICT skills possessed by SME owners in Malaysia is poor, that their use of ICT is low, and that their adoption of ICT is slow and late, primarily because they find that ICT adoption is difficult. The authors discuss the implications of their study and present their suggestions for future research direction.

Keywords: Information communication technology (ICT), small and medium enterprises, technology adoption, Internet, Malaysia

1. INTRODUCTION

In the present era of e-commerce and economic globalization, acquiring information communication technology (ICT) to support business needs, regardless of business size, is a crucial prerequisite to exploiting the potential of information technology (IT). Illiteracy in IT greatly reduces the competitiveness of an enterprise. According to the Malaysian Minister of Entrepreneurship and Development, about 70% of SME owners in Malaysia are IT illiterate (Utusan Malaysia, June 19, 2002).

The present study differs from previous ones because its unit of analysis is the SME owner rather than the firm itself, as was the case in many previous studies [Afzaal, et al., 2007; Lai & Hsieh, 2007; Shiels et al., 2003; Ndubisi & Jantan, 2003]. In studies focusing on SME firms rather than owners, the respondents were often not the owners, but IT managers who, obviously, were IT-literate and IT-competent. Studying the owners themselves is important because, as the decision-makers who are concerned with the survival and expansion of their firms, they are often too busy to learn ICT or to appreciate its potential benefits to their business. Understanding how SME owners learn to use and adopt IT will (1) fill a knowledge gap in the IT adoption model by providing insights on the link between IT illiteracy and IT adoption, and (2) help providers of training programs to develop IT-related training that will enable SME owners to quickly learn and adopt IT and thus become IT-literate..

Many studies show that SMEs are the driving engine of growth, job creation, and competitiveness in domestic and global markets. They also play a pivotal role in innovation and productivity growth [Blackburn and Athayde, 2000]. To achieve their full potential in these areas, SMEs in Malaysia need to catch up with new management and economic trends such as IT use, k-economy, and e-commerce. To this end, the Malaysian government has embarked on a major push to persuade SMEs to adopt the Internet as a new and more efficient way of doing business and generating new business. To assist in achieving this goal, the government offers funding to SMEs for computer system upgrades, training, technology acquisition, consultancy fees, and electronic commerce activities. Despite these efforts, however, SMEs in Malaysia remain on the wrong side of a digital divide [Karkoviata, 2001].

1.1. SMEs in Malaysia

Malaysia's Ministry of Internal Trade and Industry defines an SME as a company with (1) an annual sales turnover of not more than RM25 million, and (2) not more than 150 full-time employees. At present, SMEs account for more than 80% of total manufacturing establishments in Malaysia. They also account for about 35% of the total workforce in the manufacturing sector [Fong, 2002]. The majority are in the traditional sectors of food and beverages (20%), fabricated metal products (18%), wood and wood products (17%, and basic metals (4%).

To enhance prosperity and to prepare for the global market, SMEs in Malaysia continue to engage in intensive product specification, design, and engineering activities and to implement improvements in marketing and distribution. Using benefits and incentives offered by the Malaysian government, they have also taken steps to improve technology accumulation and to enhance the quality of their work force through education, experience, and skills development.

Employee education and development is vital to the success of every company. To remain competitive at the global level, companies today must prepare themselves and their employees to function successfully in a knowledge-based economy. Information technology is an important tool in meeting that challenge. By accelerating their ability to master IT, SME owners will enable themselves and their employees to compete successfully in today's global knowledge economy [Fong, 2001; Fong, 2002].

1.2. Research Objectives

The purposes of this study are (1) to examine the ICT skills and innovation characteristics of SME owners in Malaysia, and (2) to establish the relationship among a number of constructs; namely, their ICT skills, use, adoption patterns, and adoption categories.

In addition to this introductory section, this paper presents the study's theoretical framework (Section 2), methodology (Section 3), findings (Section 4), conclusions and implications (Section 5), and limitation and future research direction (Section 6).

2. THEORETICAL FRAMEWORK

This discussion of the theoretical framework covers the diffusion of innovation theory, as well as related research on IT adoption.

2.1. Diffusion of Innovation Theory

Diffusion is the process by which an innovation is adopted by members of a certain community. The most frequently cited work dealing with diffusion is *Diffusion of Innovation* [Rogers, 1995] . As Rogers points out, diffusion is not a single, all-encompassing theory, but rather several theoretical perspectives that relate to the overall concept of diffusion; that is, it is a meta theory. Four factors influence the adoption of an innovation by members of an organization: (1) the innovation itself, (2) the communication channels used to spread information about the innovation, (3) time, and (4) the nature of the group to which it is introduced [Rogers, 1995]. According to Rogers [1995], there are four major theories that deal with the diffusion of innovation. These are (1) the innovation-decision process theory, (2) the individual innovativeness theory, (3) the rate of adoption theory, and (4) the theory of perceived attributes. The present study focuses on the individual innovativeness theory and the theory of perceived attributes because they help to understand the relationship between the innovator characteristics and the adopters categories.

2.1.1. Individual Innovativeness Theory

The individual innovativeness theory is based on who adopts the innovation and when. A bell-shaped curve is often used to illustrate the percentage of individuals who adopt an innovation. According to Rogers [1995], there are five categories of adopters.

The first category is called *innovators*. These are the risk-takers and pioneers who lead the way. They are able to adopt despite a high degree of uncertainty about the innovation at the time of adoption, and are willing to accept an occasional setback when a new idea proves unsuccessful.

The second group is known as the *early adopters*. They climb aboard the train early and help spread the word about the innovation to others.

The third group is the *early majority*. They are persuaded to adopt by the innovators and early adopters, and may deliberate for some time before completely adopting the new idea. Their innovation-decision period is relatively longer than that of the innovators and early adopters.

The fourth group is the *late majority.* They approach innovation cautiously and wait to make sure that adoption is in their best interests. As a result, they do not adopt until most others have done so.

The fifth group is called the *laggards.* These are the individuals who are highly skeptical and resist adopting until absolutely necessary.

As indicated in Table 1, the categories of adopters are between the mean and the mean minus/plus the standard deviation on the normal distribution curve.

Table 1
Categories of Adopters

Categories	**Innovators**	**Early Adopters**	**Early Majority**	**Late Majority**	**Laggards**
Number of Adopters	2.5%	13.5%	34%	34%	16%
	x-2 σ	x-σ	x	x+σ	
Years					

(Source: Brychan, T. (2003), A Model of Diffusion of Technology into SME's, p. 3)

2.1.2. Theory of Perceived Attributes

The theory of perceived attributes is based on the notion that individuals will adopt an innovation if they perceive that it has the following attributes. First, the innovation must have some relative advantage over an existing innovation or the status quo. Second, the innovation must be compatible with the existing values, past experience, and practices of the potential adopter. Third, the innovation cannot be too complex nor perceived as difficult to understand. Fourth, the innovation must have trialability; that is, it can be tested for a limited time without adoption. Fifth, the innovation must offer observable results [Rogers, 1995].

Rogers [1995] asserts that an adopter's experience with one innovation influences that individual's perception of the next innovation in a technology cluster to diffuse through the individual's system. Thus, if an adopter has a negative first experience with one computer application, he or she may regard all computer applications through this perspective.

Diffusion theory provides a framework that helps to understand why IT is adopted by some individuals and not by others. This theory can explain, predict, and account for factors that increase or impede the diffusion of innovations.

2.2. Related Research in IT Adoption

Previous studies have shown that the adoption of IT by SMEs is still lower that expected [Pavic, et al., 2007; Yu, 2006]. Several barriers to IT adoption have been identified , including: lack of knowledge about the potential of IT, a shortage of resources such financial and expertise, and lack of skills [Blackburn and Athayde, 2000; Cavalcanti, 2006; Ndubisi & Jantan, 2003; Utomo, 2001]. Many studies have also focused on identifying the determinants that influence IT adoption.

Some studies looked into a broader perspective of Internet adoption and found that environmental factors such as government intervention, public administration , and external pressure from competitors, suppliers, and buyers play the key role in the adoption and implementation of IT, especially in e-commerce [Daniel & Wilson, 2002; Dasgupta, 2000; Lai & Hsieh, 2007; Scupola, 2003]. Other studies focused instead on the organizational factors, such as organization support and management support; however, few studies focused on skills and use among the owners. Very little is understood about the determinants of IT adoption among SME business owners.

In examining the organizational factors, for example, Lucchetti and Sterlacchini [2004] identify financial resources, technical skills, and firm characteristics as significant determinants of IT adoption among SMEs. On the other hand, when Seyal and Abd Rahman [2003] investigate 95 small and medium business organizations of various types, they find that the major determinants of e-commerce adoption are adoption attributes such as relative advantages, compatibility, trialability, observability, and organizational attributes such as nature, size, and type of business. In a more recent study, Seyal et al. [2007] find that management support, government support, and perceived benefits are significant predictors that influenced SMEs in Brunei to adopt IT. Regarding IT adoption in Taiwan, Lin [2006] identifies these determinants as having influence on adoption: organizational size, CEOs' characteristics, CEOs' perception of relative advantage, compatibility, and complexity.

Few studies have examined the relationship between IT skills and IT adoption. Shiels et al. [2003], for example, assert that strong IT capability—including the specific ICT skills of small firm owners—has significant influence

on the adoption of ICT. In fact, Wainwright et al. [2005] add that managerial ICT skills, ICT knowledge, and ICT practices are important determinants of whether IT is adopted or rejected by the SMEs. Ndubisi and Jantan [2003], in evaluating information system use among small- and medium-sized firms in Malaysia, find that computing skills and technical backing are strong anchors of the perception of usefulness and also wield direct influence on system use. In another study conducted by Ndubisi and Kahraman [2005], they find that the use of advanced systems is significantly related to innovativeness, and suggest that innovativeness is an important trait in determining ICT use among women entrepreneurs in Malaysia.

Based on the literature reviewed, this study offers the following hypotheses:

Hypothesis 1: There is a relationship between ICT skills and ICT use in the workplace.

Hypothesis 2: There is a relationship between ICT skills and innovation characteristics.

Hypothesis 3: There is a relationship between ICT use at the workplace and innovation characteristics.

Hypothesis 4: There is a relationship between innovation characteristics and adopters category.

3. METHODOLOGY

This discussion of methodology covers scope of the study, instrumentation, reliability test of the instrument, and data analysis.

3.1. Scope of the Study

According to Rockman [2005], ICT literacy proficiency is the ability to use digital technology, communication tools, and/or networks appropriately to solve information problems in order to function in an information society. In a study by Adeyoyin [2005], ICT literacy is referred to as having end user skills and basic knowledge of the computer; specifically, how it functions, how to input and retrieve information, and how to navigate. The present study, however, concentrates mainly on the basic skills of IT – e.g., keyboard use; word processing; spreadsheets; e-mail skills, such as composing, reading, and sending messages and attachments; CD ROM skills; and Internet skills such as browsing web-sites and copying and printing from web-sites.

3.2. Instrumentation

The questionnaire used in this study to measure ICT adoption was developed from the constructs used in the individual innovativeness theory and the theory of perceived attributes. In measuring ICT adoption, the study sought information in five areas: (a) respondent's background, (b) information and communication technology skills possessed by the respondent, (c) the

respondent's use of information and communication technology at the work place, (d) innovation characteristics of the respondent, and (e) the respondent's adopter category. The questionnaire included a five-point Likert scale for use by respondents in indicating their response to each of the items asked.

Part (a) consisted of five questions concerning the respondent's position, age, gender, race, and highest education attainment. Part (b) included 13 questions to measure the respondent's basic skills, as well as his or her skill in using e-mail, CD-ROM, and the Internet. Part (c) contained 17 questions regarding Internet use, CD-ROM use, and e-mail use at the work place. Part (d) consisted of 49 questions pertaining to the five innovation characteristics proposed in the literature – relative advantage, compatibility, complexity, trialability, and observability. Part (e) included 25 questions designed to measure the five categories of adopters.

3.3. Reliability Test of the Instrument

A pilot test was conducted involving 40 businessmen, each of whom owns a company. The Cronbach's coefficient alpha values for the pilot test and the actual data for the variables are shown in Table 2. For the innovation characteristics variable (complexity construct), one item ("I find Internet technology is confusing") was deleted from the original questionnaire in order to increase the alpha values. Next, after the actual data was collected, another reliability test was done for every statement in the questionnaire for the purposes of internal reliability.

3.4. Data Analysis

First, before any statistical analysis was done, all negative statements were recoded. Second, a factor analysis was conducted on all statements for innovation characteristics and all statements for innovator categories. For innovation characteristics, eight factors were produced. After reliability tests were done for each of these factors, only five remained. Based on the statements in each factor, the factors were then labelled.

Factor 1, labelled trialability, consists of 11 statements (α=0.969).

Factor 2, labelled relative advantage, consists of nine statements (α =0.891).

Factor 3, labelled compatibility, consists of seven statements (α=0.978).

Factor 4, labelled complexity, consists of seven statements (α=0.811).

Factor 5, labelled observability, has three statements. The reliability value for Factor 5 is low, and one item was deleted, leaving only two statements (α=0.6934).

Only 36 statements were used for further statistical analysis. The details are shown in Table 3.

For innovator categories, there were 25 statements in the instrument. Factor analysis was also conducted on the 25 statements. The analysis produced three factors. A reliability test was done for all three factors. Factor 1 was labelled *innovator* with 13 statement (α =0.966), Factor 2 was labelled *late majority* with six statements (α =0.785). Factor 3 was not selected because it was unreliable, even after deletion of items. The detailed results are shown in Table 4.

Table 2
Pilot Test and Actual Data Reliability Statistics of Research Variables

	Standardized Cronbach Alphas	
Variables	Pilot Test	Actual Data
ICT Skill	0.981	0.969
a) Basic skill	0.923	0.939
b) E-mail skill	0.964	0.996
c) CD ROM (only 1 construct)		
d) Internet skill	0.936	0.992
ICT Use at Workplace	0.946	0.966
a) Internet use	0.940	0.949
b) CD ROM use	0.805	0.924
c) E-mail use	0.920	0.963
Innovation Characteristics	0.916	0.918
a) Relative advantage	0.930	0.884
b) Compatibility	0.957	0.975
c) Complexity	0.977	0.921
d) Trialability	0.944	0.955
e) Observability	0.865	0.749
Adopters Categories	0.750	0.869
a) Innovator	0.888	0.920
b) Early adopter	0.787	0.880
c) Early majority	0.824	0.714
d) Late majority	0.705	0.790
e) Laggard	0.730	0.767
Learning Barriers	0.819	0.863
a) Cultural	0.858	0.716
b) Financial	0.732	0.881
c) Access and provision	0.867	0.786
d) Awareness	0.972	0.900
Overall	0.942	0.960

Table 3
Factor Analysis and Reliability Analysis for Innovation Characteristics

Item		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
INTEREST	I find using Internet technology interesting.	.571	.291	.554	.005	.004
HAVEOPPU	I have the opportunity to try Internet technology.	.799	.199	.125	.002	.008
TRIALVIS	A trial version is available.	.780	.203	.153	.006	-.005
SEVETIME	I have tried several times to use Internet technology.	.861	.254	.213	-.001	.123
TAUGHT	I had taught myself to use Internet technology before I was asked to use it.	.811	.243	.294	.002	.008
TRIED	I have tried using Internet technology and found it interesting.	.858	.255	.271	.000	.007
ENJOY	I enjoy trying new things such as internet technology.	.797	.221	.229	-.004	.004
EXPERIME	I can experiment with Internet technology as many times as I wish.	.825	.279	.283	.008	.008
TEACHMYS	I can teach myself to use Internet technology.	.694	.427	.298	.008	-.001
HADUSEIT	I had opportunities to experiment with Internet technology before I had to use it myself.	.824	.224	.242	.001	-.002
SKILLS	I have the skills/training I need to use Internet technology.	.751	.235	.257	.148	.224
EASIER	Information technology (IT) makes my job easier.	.341	.808	.316	.007	-.003
QUICKLY	IT enables me to complete my tasks more quickly.	.342	.801	.341	.000	.009
INCPRODU	IT increases my productivity.	.318	.804	.338	-.000	.105
USEFUL	IT is useful for study and work.	.168	.508	.119	.003	.004
EFFECTIV	IT improves the effectiveness of projects.	.314	.831	.277	.002	.006
QUALITY	IT enhances the quality of projects.	.222	.627	.004	.150	-.003

Table 3 *(continued)*

Item		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
USEPROJE	IT is useful for projects.	.116	.591	.184	-.005	-.003
LEARN	IT helps me learn my work.	.316	.748	.350	.006	.130
EASY	Using Internet technology is easy	.462	.607	.136	.000	.009
WORKSTYL	Using Internet technology fits my work style.	.414	.317	.722	.126	.000
COMPATIB	Using Internet technology is compatible with other software.	.452	.416	.685	.004	.004
FITWORKS	Internet technology fits in with the way my organization works.	.458	.369	.728	.009	.005
JOBREQUI	Internet technology is suitable for my job requirements.	.460	.354	.738	.106	.005
HELPBUSI	Internet technology helps my business a lot.	.485	.373	.716	.007	.000
SUITBUSI	Internet technology suits my company business.	.475	.358	.724	.008	.004
HELASSIG	I enjoy using Internet technology because it helped a lot in my past assignments.	.524	.383	.652	.005	.002
TROUBLE	Using Internet technology is more trouble than it is worth.	.006	-.198	.005	.513	.229
NOTFORME	I don't care what other people say; Internet technology is not for me.	.101	.005	-.106	.694	.004
DIFFLEAR	I find it difficult to learn to use Internet technology.	.156	-.157	.008	.653	.239
NOTIMPRO	Internet technology doesn't improve my work.	-.008	.148	.119	.756	-.001
LONGTIME	It takes long time to learn using Internet technology.	-.002	-.005	.003	.685	.213
NOTHELP	Internet technology does not help me at my workplace.	-.007	.219	.134	.699	-.004
DHBENEFI	I don't know how I can benefit from Internet technology.	.155	.003	.005	.511	-.003

Table 3 *(continued)*

Item		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
FEWGROUP	Few groups at my site have invested time and money in Internet technology.	.004	.000	.000	.180	.756
SEVPEOPL	I can think of several people at my site who have promoted the use of Internet technology for years.	.000	.003	.007	.191	.767
Eigenvalues		20.085	4.253	2.693	2.465	1.615
% Variance		40.990	8.681	5.497	5.030	3.296
Reliability		.969	.891	.978	.811	.693

F1= Trialability; F2 = Relative Advantage; F3 = Compatibility; F4 = Complexity; F5 = Observability)

Table 4
Factor Analysis and Reliability Analysis for Adopter Characteristics

Item		Factor 1	Factor 2
ENJOYLEA	I enjoy learning new technology.	.843	.103
INTIMPOR	I find Internet technology is very important.	.702	-.004
COMMUNIC	Internet technology enables me to communicate with friends with no borders.	.879	.009
RESOURCE	I have the resources necessary to use Internet technology.	.866	.007
DIFFCOMP	It is fine with me to have to learn difficult and complex things.	.844	.000
NOPROBLE	I have no problem learning about Internet technology.	.889	.143
CANLEARN	I can learn about Internet technology by myself.	.851	.162
TRYNEW	I like to try new technology quickly.	.910	.010
ENJLEARN	I enjoy having learned about Internet technology first, compare with my friends.	.902	.131
INTERACT	I interact frequently with friends through the Internet.	.854	.100
NFULLYUT	I have learned about the Internet, but have not fully used it yet.	.718	.002
USEINT	I have used Internet technology with some friends.	.832	.149
TRIEDINT	I have tried using the Internet and find it useful, so will learn how to use it.	.762	.302

(continued)

Table 4 *(continued)*

Item		Factor 1	Factor 2
ADVICE	My friends always come to me for advice on using Internet technology.	.177	.601
WILLUSE	I will use the Internet after I have learned it for quite a while.	.139	.472
KNEWFRIE	I know some friends who have used Internet technology.	.007	.665
AFTERFRI	I will learn how to use the Internet after seeing friends use it.	.198	.762
ENCOURAG	My friends encourage me to learn how to use the Internet.	.008	.726
FRIENKNE	Most of my friends knew how to use the Internet; I think I should learn how to use it also.	-.002	.646
Eigenvalues		9.970	3.464
% Variance		39.880	13.856
Reliability		.966	.785

Note: F1 = Innovator; F2 = Late majority

4. FINDINGS

This discussion of findings covers sample and data collection, respondents' background, ICT skills, ICT use in the workplace, innovation characteristics, adopters' categories, and ICT adoption predictors.

4.1. Sample and Data Collection

A total of 383 respondents participated in this study. Of these, 16 participated using mailed questionnaires, and 367 participated using questionnaires that were personally distributed.

Since SME owners are scattered throughout Malaysia, the researcher initially thought it would be appropriate to use mailed questionnaires. The convenient sampling method was used. There are about 10,000 SMEs in Malaysia registered with the Ministry of International Trade and Industry .The researcher mailed questionnaires to the owners of 1,000 of these SMEs. The questionnaires were sent to owners rather than employees because the IT illiteracy problems reported are faced by the owners, not the employees. About one week after the questionnaires were mailed, only 16 responses had been received. After that, no responses were received. Since the response rate was too low (only1.6%), the researcher chose not to send any reminders in order to save the mailing cost. Instead, the researcher decided to use personally distributed questionnaires. This time, the researcher used a stratified sampling method in which the recipients of the questionnaires were identified to be representatives in

each state in Malaysia. Three enumerators were used to distribute the questionnaires, and it took them two months to get 367 responses.

4.2. Respondents' Background

Data on the respondents' background are shown in Table 5. As indicated, 151 respondents (39.4%) were middle-aged; that is in the range of 36-45 years of age. Only seven respondents (1.8%) were younger than 25 years of age, indicating that not many young people are SME owners. With regard to gender, 247 respondents (64.5%) were male SME owners and 136 (35.5%) were female. In terms of race, the highest percentage of SME owners were Chinese (211, or 55.1%). With regard to education, 205 of the respondents (53.5%) had completed high school only.

Table 5
Distribution of Respondents' Background
or SME Owners in Malaysia (n=383)

Item	Frequency	Percentage
Race		
Malay	97	25.3%
Chinese	211	55.1%
Indian	63	16.4%
Others	12	3.1%
Gender		
Male	247	64.5%
Female	136	35.5%
Age		
Less than 25years old	7	1.8%
25-35 years old	98	25.6%
36-45 years old	151	39.4%
46-55 years old	93	24.3%
Above 55 years old	34	8.9%
Education		
Primary school	39	10.2%
High school	205	53.5%
Diploma	69	18.0%
Bachelor's degree	54	14.1%
Master's degree	13	3.4%
Ph.D.	2	0.5%
Other	1	0.3%

4.3. ICT Skills

This study was conducted to examine the ICT skills (basic skills e-mail skill, CD-ROM skill, and Internet skill) of SME owners in Malaysia. The results in Table 6 show that the owners' skills are quite poor (mean 2.5514); that is, below average.

Table 6
The Mean Score for ICT Skills of SME Owners in Malaysia

	N	Minimum	Maximum	Mean	Standard Deviation
Basic Skill	383	1.00	10.83	2.859	1.333
E-mail	383	1.00	5.00	2.589	1.528
CD-ROM	383	1.00	5.00	5.504	1.467
Internet	383	1.00	5.00	2.253	1.381
ICT Skill	383	1.00	6.38	2.551	1.317

Note: 1= very poor; 2 = poor; 3 = average; 4 = good; 5 = excellent

4.4. ICT Use in the Workplace

For ICT use in the workplace, respondents were asked to indicate how often they use the Internet, CD-ROM, and e-mail at work. As shown in Table 7, the respondents seldom (mean 1.9103) used the Internet and e-mail at their workplace.

Table 7
The Mean Score for ICT Use at Workplace by SME Owners in Malaysia

	N	Minimum	Maximum	Mean	Standard Deviation
Internet Use	383	1.00	4.36	1.665	0.939
CD-Rom Use	383	1.00	5.00	1.858	1.133
E-mail Use	383	1.00	5.00	2.208	1.424
ICT Use	383	1.00	4.65	1.910	1.083

Note: 1 = never; 2 = seldom; 3 = not sure; 4 = often; 5 = always

4.5. Innovation Characteristics

The literature has identified five innovation characteristics. These are the dimensions for why innovation was adopted by the respondents. The dimensions are relative advantage, compatibility, complexity, trialability, and observability. As indicated in Table 8, complexity was identified as the highest (mean 4.2469) among respondents, which means that SME owners find IT adoption difficult.

Table 8
The Mean Score for the Innovation Characteristics of SME Owners in Malaysia

	N	Minimum	Maximum	Mean	Standard Deviation
Relative Advantage	383	1.00	5.00	3.157	1.265
Compatibility	383	1.00	5.00	2.564	1.316
Complexity	383	3.00	5.00	4.247	0.544
Trialability	383	1.00	5.00	2.858	1.226
Observability	383	1.00	5.00	3.482	0.910
Innovation Characteristics	383	1.63	4.85	3.262	0.768

Note: Disagree 1 ----------→ Agree 5

4.6. Adopters' Categories

Five adopters' categories are discussed in the literature: innovators, early adopters, early majority, late majority, and laggards. The findings presented in Table 9 shows that the SME owners are in the late majority (mean 3.4099) adopters' category. For them, adoption may be both an economic necessity and a result of increasing network pressure from peers. The late majority approach innovations cautiously, and do not adopt innovations until most others have done so. A further analysis was conducted to examine who the late majority adopters are. Results show that they have very poor IT skills (10.3%), never use the Internet at their workplace (43.1%), are Chinese (48.2%), and left high school without graduating (48.6%).

Table 9
The Mean Score for Adopters' Categories of SME Owners in Malaysia

	N	Minimum	Maximum	Mean	Standard Deviation
Innovators	383	1.00	5.00	2.876	1.1639
Late Majority	383	1.00	5.00	3.410	0.792
Adopters' Categories	383	1.04	4.85	3.143	0.792

Note: Disagree 1 ----------→ Agree 5

4.7. ICT Adoption Predictors

The results presented in Table 10 and Table 11 support the research hypothesis. The data show that ICT skill, ICT use, innovation characteristics, and adopters' category all are significantly related to each other. ICT skill is positively correlated to ICT use (r=0.790, p=0.000), and ICT skill is highly correlated to innovation characteristics (r=0.822, p=0.000). At the same time, ICT use is also correlated to innovation characteristics (r= 0.754, p=0.000). Results show that there is strong relationship between innovation characteristics and adopter categories (r=0.823, p=0.000). Moreover, ICT skill, ICT use, and innovation characteristics account for a 75.1% variation in the adopters' category. ICT use, however, is not significant in this prediction (p=0.222).

Table 10
Correlation Analysis of the Studied Variables

Variable	Alpha	Mean	SD	1	2	3	4
1. ICTSKILL	0.969	2.551	1.317	-			
2. ICTUSE	0.966	1.910	1.083	0.790**	-		
3. INNOCHAR	0.918	3.262	0.768	0.822**	0.754**	-	
4. ADOPCATE	0.869	3.143	0.792	0.832**	0.720**	0.823**	-

**p<0.001; ICTSKILL = ICT skills, ICTUSE = ICT use; INNOCHAR = innovation characteristics; ADOPCATE = adopters' category

Table 11
Regression Analysis Predicting Adopters' Categories

Independent Variables	ß	t-value	p-value
ICT skill	0.453	8.988	0.000*
ICT use	0.053	1.223	0.222
Innovation characteristics	0.409	8.698	0.000*

Notes: Dependent variable: Adopters' category; *statistical significant at p<0.05; Adjusted R^2= 0.751; F = 384.320, Sig = 0.000

5. CONCLUSIONS AND IMPLICATIONS

The findings of this study show that SME owners in Malaysia possess below-average ICT skills and seldom use the Internet at their workplace. In terms of innovation characteristics, these are in the complexity category, which means that they find IT adoption difficult. With regard to the adopters' category, SME owners in Malaysia are in the late majority. Further, their ICT skills, ICT use, and innovation characteristics are significantly correlated to their adoption category. Because their ICT skills are below average, they seldom use ICT, find ICT adoption difficult, and are late in the adoption process.

This study has shown that the level of ICT adoption among SME owners in Malaysia is lower than expected. Some studies have shown that government support is significantly important in supporting adoption [Daniel and Wilson, 2002; Dasgupta, 2000; Lai & Hsieh, 2007; Scupola, 2003; Seyal et al., 2007]. In Malaysia, efforts have been made to improve technology accumulation through education, experience, and skills development by optimizing the benefits and incentives made available by the Malaysian government. Malaysia has embarked on a major push to persuade SMEs to adopt the Internet as the new and more efficient way of doing business. Despite these efforts, SMEs in Malaysia remain on the wrong side of the digital divide. A similar situation is faced by SMEs in Taiwan. According to Yu [2006], although the Taiwanese government has encouraged SMEs to seek global trade opportunities and has constructed one of the highest quality national information infrastructures in the world, the rate of e-marketplace adoption among Taiwanese SMEs is still low. As the results of the present study show, one of the determinants of ICT adoption is ICT skills. Even if the government were to provide incentives and to improve the country's IT infrastructure, the efforts would be futile if no effort is made to improve the ICT skills of business owners.

This study has several implications. It provides useful insights into the knowledge gap in understanding ICT adoption among the SMEs. The owners of small- and medium-sized enterprises are an important factor that has been largely overlooked by many previous studies. Another important practical implication is that the training agencies responsible for providing ICT training to SME owners must understand not only how this group of adults learn, but also what the obstacles are that they usually face. At the same time, government has to increase its effort to create awareness among SMEs regarding the potential benefits of ICT to small- and medium-sized businesses. The government may have to either enforce compulsory training or provide some inducement to encourage SMEs to implement ICT training.

Malaysia's competitive edge in today's turbulent global economy will increasingly depend on the quality and productivity of its human capital. Building human capacity must be based on clear and dynamic strategies that can effectively respond to the rapid changes taking place. Companies must be capable, therefore, of adopting and adapting new technologies. They have to continuously upgrade themselves, and stay ahead of change by learning, re-learning, and learning again, and by making continuous retraining and skills upgrading a pertinent business strategy in their pursuit of increasing product quality and market share. These efforts should focus on not only the employees of the companies, but also the owner themselves. The owners should first set a good example in acquiring ICT knowledge and skills before trying to motivate their employees to do the same.

6. LIMITATION AND FUTURE RESEARCH DIRECTION

The limitation of this study is that the survey was conducted using a questionnaire written in English. Although English is the second language of Malaysia, many SME owners do not possess English language proficiency because of their education background. Some genuine SME owners may have been omitted, for this reason. Future research in this area should probably use a dual-language questionnaire. Other areas of future research include an investigation of what has contributed to the poor ICT skills of SME owners in Malaysia, an investigation of learning barriers in this group, and an examination of the relationship between the IT skills of SME owners and the IT infrastructure and IT budget of their respective companies.

REFERENCES

Adeyoyin, S.O. 2005. Information and communication technology (ICT) literacy among the staff of Nigerian University Libraries, Library Review 54(4), 257-266.

Blackburn, R., and Athayde, R. 2000). Making the connection: The effectiveness of Internet training in small businesses, Education and Training 42(4/5), 289-299.

Brychan, T. 2003. A model of diffusion of technology into SME's, downloadable from website http://www.sbaer.uca.edu/Research/1999/ICSB/99ics224.htm

Cavalcanti, G. 2006. Barriers to implementation of information and communication technologies among small- and medium-sized enterprises: The digital divide through the business lens, MBA., California State University, Fresno, 57 pp.; AAT 1444963.

Daniel, E., and Wilson, H. 2002. Adoption intention and benefits realized: A study of e-commerce in UK SMEs, Journal of Small Business and Enterprise Development 9(4), 331-348.

Dasgupta, S. 2000. Information technology adoption in the Greek banking industry, Journal of Global Information Technology Management 3(3), 22-30.

Fong, C. 2001. Keynote address by the Minister of Human Resources in conjunction with the launching of the seminar for small and medium industry (SMI) employers, May 3, 2001, Renaissance Melaka Hotel, Malaysia.

Fong, C. 2002. Keynote address by the Minister of Human Resources in conjunction with the launching of the seminar for small and medium industry (SMI) employers,May 21, 2002, Hotel Nikko, Kuala Lumpur, Malaysia.

Karkoviata, L. 2001. SMEs reluctant to go online, Asian Business 37(4), 75-76.

Lai, F., and Hsieh, C.T. 2007. On network external, e-business adoption and information asymmetry, Industrial Management & Data Systems 107(5), 728-746.

Lin, C.S. 2006. Organizational, technological, and environmental determinants of electronic commerce adoption in small and medium enterprises in Taiwan, Ph.D., Lynn University, 216 pp.; AAT 3213333.

Lucchetti, R. ,and Sterlacchini, A. 2004. The adoption of ICT among SMEs: Evidence from an Italian Survey, Small Business Economics 23, 151-168.

Malaysia, Utusan Malaysia, 70 peratus pengusaha IKS 'buta' IT, June 19, 2002, pp. 29.

Ndubisi, N.O, and Jantan, M. 2003. Evaluating IS usage in Malaysian small and medium-sized Firms Using the Technology Acceptance Model, Logistics Information Management, 16 (6), 440-450.

Ndubisi, N.O., and Kahraman, C. 2005. Malaysian women entrepreneurs: Understanding the ICT usage behaviors and drivers, Journal of Enterprise Information Management 18 (6), 721-739.

Pavic, S., Koh, S.C.L;, Simpson, M.; and Padmore, J. 2007. Could E-business create a competitive advantage in UK SMEs? Benchmarking: An International Journal 14 (3), 320-351.

Rockman, I.F. 2005. Editorial ICT Literacy, Reference Services Review 33 (2), 141-143.

Rogers, E.M. 1995. Diffusion of Innovations (4th ed.) New York: Free Press.

Scupola, A. 2003. The adoption of Internet commerce by SMEs in the south of Italy: An environmental, technological and organizational perspective, Journal of Global Information Technology Management 6 (1), 3-18.

Seyal, A.,H., and Abd Rahman, M.N. 2003) A preliminary investigation of e-commerce adoption in small and medium enterprises in Brunei, Journal of Global Information Technology Management 6 (2), 2-15.

Seyal, A.H.; Abd Rahman, M.N.; and Hj Awg Mohamad, H.A.Y. 2007.. A quantitative analysis of factors contributing electronic data interchange adoption among Bruneian SMEs, Business Process Management Journal 13 (5), 728-746.

Shiels, H.; Mclvor, R.; and O'Reilly, D. 2003. Understanding the implications of ICT adoption: Insights from SMEs, Logistics Information Management 16 (5), 312-326.

Utomo, H. 2001. Contributing factors to the diffusion of IT within small- and medium-sized firms in Indonesia, Journal of Global Information Technology Management 4 (2), 17-32.

Wainwright, D.; Green, G.; Mitchell, E.; and Yarrow, D. 2005. Toward a framework for benchmarking ICT practice, competence and performance in small firms, Performance Management: The International Journal for Library and Information Services, 6 (1) 39-52.

Yu, C.S. 2006. Exploring influences on Taiwanese e-marketplace adoption decisions, Journal of Global Information Technology Management 9 (2), 5-21.

ABOUT THE AUTHOR:

Dr. Junaidah Hashim is an associate professor in the Department of Business Administration, Faculty of Economics & Management Sciences, International Islamic University of Malaysia. Her research has been published in the following academic journals: *Industrial European Training Journal, Asia Pacific Management Review, IIUM Journal of Economics and Management,* and *School of Management Journal.* Her vast work experience in the private sector prior to joining the university, combined with her academic work, has provided her with special combination of skills.