

INFORMATION AND COMMUNICATIONS TECHNOLOGY IN ASIA PACIFIC COUNTRIES: IMPLICATIONS FOR SMALL AND MEDIUM ENTERPRISES IN MALAYSIA

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ABSTRACT

Information communications and technology (ICT) is transforming the environment in which SMEs operate and changing the paradigms of value creation, customer satisfaction and business effectiveness. This paper attempts to explore global and Asia Pacific ICT usage and the major factors influencing SMEs. It focuses particularly on Malaysia where the development of ICT usage amongst SMEs is one of the main policy items in the agenda of the Malaysian government. It describes a survey of SMEs in north and eastern peninsula Malaysia 1999-2000.

INTRODUCTION

Many refer to Information and Communications Technology (ICT) as another revolution, which is a driving force transforming economic, business, commercial activities and socio-political changes in a borderless world. ICT covers hardware, software, telecommunications, digital and database management and other information processing techniques/technologies used in computer- and/or electronic-based information systems. ICT is also described as the materials, digital resources, virtual and psychical data or technical knowledge that are processed in a meaningful way to a potential user and that possess values to affect a potential user's future behavior or decision (Davis and Olson 1985). Nowadays, the words, phrases and acronyms such as ICT, Internet, e-commerce, k-economy and knowledge-based information are in wide currency as the importance of information as a business resource is increasingly accepted. While the words are often used interchangeably, many consider that information technology and the Internet are sub-sets of ICT and that e-commerce is a business utilization of ICT (see for instance, Moha Asri 2001 and Beal 2000). However, the definition of e-commerce is vague; some confine it to cases where there is electronic payment (Williams 1999:12) others use it more broadly (Williams 1999:1). In this paper the broad definition is used: e-commerce is the utilization of ICT for business purposes. There are dimensions of this phenomenon that can be further presented in view of accelerating process of trade, investment, finance and, more significantly, information technology across national boundaries. It is seen as reaching at a point where a small ticking drop anywhere in the globe, may and can trigger a stock crash, a recession, or a massive movement of capital and foreign exchange across the world. It is within this framework that globalisation and information is not simply confined to trade, investment and financial flows. It is now also extended to the flows of technology, businesses, services, ideas and persons.

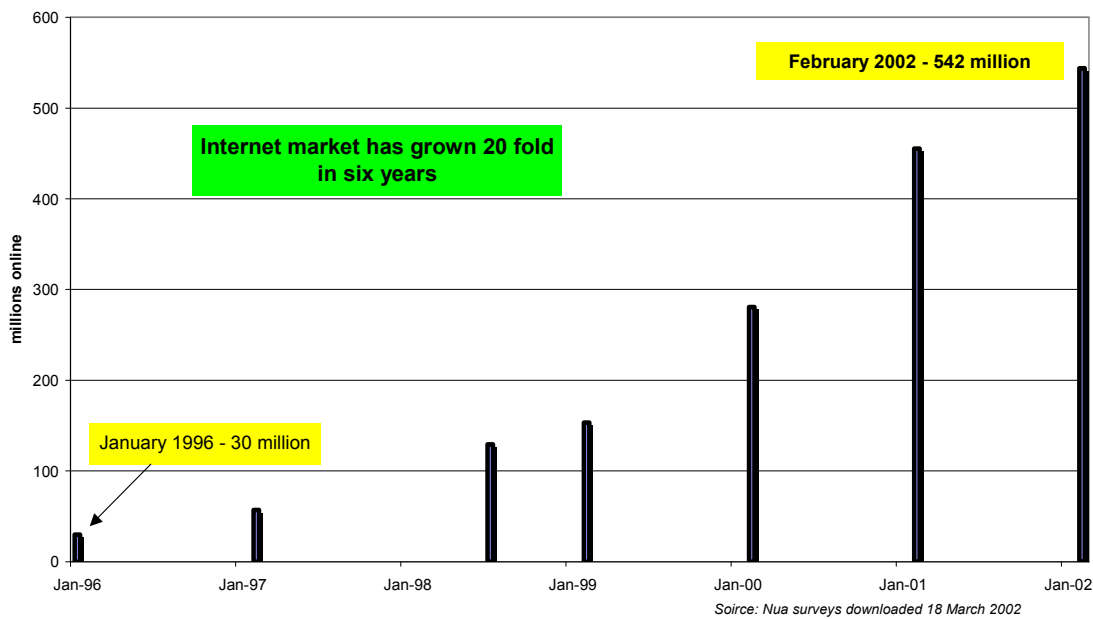
At the same time, it has been increasingly recognized that the development and prosperity of small and medium enterprises (SMEs) within this global information and communication technology environment is becoming ever more important and more vital to any economy, not least to the economies in the Asia Pacific countries. SMEs will increasingly have to confront a number of issues and challenges rising from global information and communication technology. It is reported that the growth of Internet use by American small businesses has been inexorable and the Small Business Administration has predicted that 85 percent of them will be conducting business 'over the Internet' by 2002 (Williams 2000:2). The trend seems to be even more fundamental than the many advantages and opportunities ICT open up for SMEs, such as expanding their geographical market (Lituchy and Rail 2000, Mc Donagh and Prothero 2000). Many have expressed confidence that SMEs would be dramatically transformed and would fast adapt to meet the new situation. They argue that SMEs and their activities will be more global, highly dependent on information and knowledge-based activities and the Internet in the overall so-called "digital era of information and communication technology". Nonetheless, some pessimistic views are expressed since many SMEs are hampered by their low capital ratio and low productivity

which results in the slowness of traditional SMEs to utilize ICT. Global information and communication technology development provides great challenges for SMEs in a number of aspects concerning their survival, changes, prosperity as well as policies and strategies. This paper attempts to address the development of ICT in Asian Pacific countries and its implications for SMEs with special reference to the case of Malaysia.

ICT IN ASIA PACIFIC REGION

The development of global ICT, particularly the Internet, has been extremely swift and e-commerce is rapidly emerging as a key component of business practice, certainly in the United States. In 1998, for instance, the retail income from Internet in the United States was US\$8 billion but increased to US\$18.6 billion in 1999. It was expected to reach US\$80 billion by the year 2003 (Beal 2001). It was also recorded that while one quarter of the enterprises in Europe were involved in e-commerce activities in 1999, more than two-thirds were by 2000. ElectricNews.Net has estimated that European B2B e-commerce will grow from \$500 billion in 2002 to \$2,300 billion in 2005 while Gartner forecasts that global e-commerce revenues will increase from \$1,930 billion to \$8,530 billion over the same period (Nua2000b). Moreover, it is widely acknowledged that e-commerce is driving massive restructuring of information-intensive and service-oriented industries. These include entertainment, banking, travel, advertising, gaming, stock trading and utilities. One of the most significant applications of ICT nowadays is the widespread use of Internet for commerce and business activities even in traditional industries. This process is accelerated in industries where the product or service is largely digital, and new forms of products and services are being generated, and this provides entirely new ways of delivering value to the customer. Often businesses or enterprises that are relatively consumer-focused will want to bypass intermediaries and sell directly to customers. E-commerce has the least impact when physical goods are delivered and the only major task is to gather or reconcile the flow of goods and information. Moreover, Internet and specifically intranets are becoming the core backbone for the emerging electronic workplace.

In many countries in the Asia Pacific the Internet has moved to the forefront of popular culture and seized public consciousness. South Korea is an interesting example of pro-active government policy aimed at developing e-commerce and ICT usage (MOCIE 2000). The government has put forward a "e-commerce roadmap" (KT 2001a and Kim Deok-Hyon 2001a) in order "to lay foundation for e-Korea, knowledge-based society (KH 2001a). In addition, President Kim Dae-jung pledged 10 trillion Won (US\$7.8 billion) in August 2001 to support R&D in key next generation sectors such as ICT, biotechnology, nanotechnology, environment technology and cultural technology. The aim is to make Korea a leader in ICT in Asia (Kim Mi-Hui 2001).

Figure 1: Trend of Internet Worldwide (1996-2002)

Source: http://www.nua.ie/surveys/how_many_online/world.html
Downloaded 18 March 2002

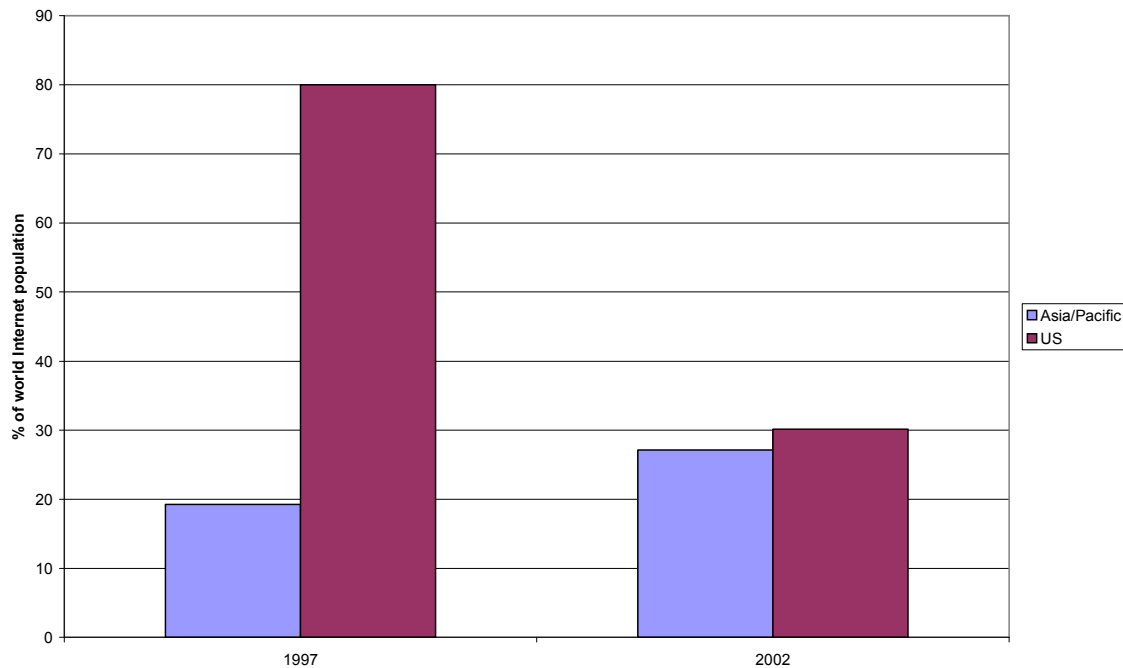
Meanwhile, based upon surveys compiled by the Irish company Nua (Figure 1), the global Internet market – the number of people connected to the Internet – has grown 20-fold over the last six years, from 30 million at the beginning of 1996 to 542 million in February 2002. Although there are methodological and definitional issues (Beal 2001) it is clear that the growth has been explosive.

Table 1 Distribution of Internet Users by Region (2002)

	Number (million)	Share (%)
World Total	544.20	100.0
Africa	4.15	0.8
Asia/Pacific	157.49	28.9
Europe	171.35	31.5
Middle East	4.65	0.9
Canada & USA	181.23	33.3
Latin America	25.33	4.7

Source: Nua- http://www.nua.ie/surveys/how_many_online/; Downloaded 18 March 2002

Table 1 shows that this Internet market is currently divided almost equally between Asia/Pacific, Europe and North America, with only a small part elsewhere; Africa has just 0.8% of global Internet users. In the early days the United States had the lion's share of Internet connections but that dominance is fading although it is still by far the largest number (Figure 2). Within the Asia/Pacific itself (which by this definition includes Australia and New Zealand) there is considerable variation in the number of users, connectivity rate and growth. Table 2 shows online numbers and connectivity rate (the percentage of the population connected to the Internet) for the major Asia/Pacific economies in 1997 and 2002. Data for the world and for the United States is included for comparison. According to this table, which utilizes the latest comprehensive data available, Japan still leads the region in terms of numbers, though not in connectivity. However, a recent report claims that China has leapt to the lead with "56.6 million households with access to the Internet", some 5.5% of the population (Nua 2002a). Whatever the precise number of Chinese connected to the Internet may be it is clear that China, and more broadly the Chinese-language area (i.e. including Hong Kong and Taiwan), will be the major Internet market in the Asia Pacific if not now, then fairly soon. Moreover, just as China has overtaken the United States as a mobile phone market in a relatively short space of time it will also become the largest Internet market in the world. The implications of that for business, including SMEs, is profound.

Figure 2: Asia Pacific catches up with US in share of world Internet population, 1997-2002

Sour

ce: Source: Adopted from Nua, downloaded on 19 March 2002
<http://www.nua.com/surveys/how_online/index.html>

In terms of connectivity rate the salient points from Table 2 are

- Connectivity is highest in the more developed economies – Australia, New Zealand, the ‘city states’ of Singapore and Hong Kong SAR, Taiwan and South Korea.
- The connectivity rates in these economies is at advanced world levels and matches that of the United States
- Japan’s rate is lower than might be expected from her general level of economic development and technology leadership
- The larger, and less developed counties, such as China, Indonesia, Philippines and Thailand have broadly similar national rates, about 2% to 5%. However, these national averages mask considerable variation and urban rates can be quite high. Coastal urban China, in particular, could be considered as a separate, medium developed, Internet market
- Malaysia occupies a medium position, but will probably achieve advanced Internet connectivity rate, say 50%+, in a couple of years.

Table 2: Internet Connectivity in Asia Pacific Countries 1997-2002

Area	Number (millions)		Connectivity rate (% of population)	
	1997	2002	1997	2002
World	70.0	544.2	1.7	9.0
Australia	1.2	10.6	6.7	54.4
China	0.2	33.7	0.0	2.7
Hong Kong	0.5	4.3	7.9	59.0
Indonesia	0.1	4.4	-	1.9
Japan	8.0	49.7	6.3	39.2
Malaysia	0.1	3.7	0.7	17.0
New Zealand	0.3	2.0	9.1	49.9
Philippines	0.1	2.0	-	2.5
Singapore	0.5	2.3	14.7	50.8
South Korea	0.7	22.2	1.5	46.4
Taiwan	1.7	11.6	7.7	51.9
Thailand	0.1	1.2	-	2.0
Total A/P	13.5	147.7	na	na
US	56.0	164.1	21.0	58.5
Share of world Internet population				
Asia/Pacific	19.3	27.1	na	na
US	80.0	30.2	na	na

Source: Adopted from Nua, downloaded on 19 March 2002

<http://www.nua.com/surveys/how_online/index.html>

Notes: Dates are approximate and refer to the surveys nearest to the beginning of 1997 and to February 2002.

'Asia/Pacific refers to the sum of the specified countries and so differs slightly from the definition in Table 1

The Role of Government

ICT era is marked with the use of the Internet by government and its agencies to conduct its internal business, to communicate with citizens and the world at large. Of particular relevance in this context is the government's use of ICT to interact with business as a purchaser and supplier of goods and services and as a source of regulation and facilitation. Governments are also moving towards the electronic collection of customs data and duty, and taxes. A survey conducted by World Market Research Centre 2001 found that Asia Pacific countries such as Australia, Singapore, Taiwan are among the top countries in 'e-government' (see Table 3). Malaysia, though ranked 16 overall, was fourth in the region.

Table 3: Asia Pacific Countries in Global E-government rankings

<i>rank</i>	<i>country</i>	<i>%</i>
1	US	57.2
2	Taiwan	52.5
3	Australia	50.7
8	Singapore	43.4
16	Malaysia	39.0
26	New Zealand	36.8
38	Japan	34.9
47	South Korea	33.4
52	Philippines	32.8
53	Vietnam	32.8
56	Brunei	32.7
71	Thailand	30.8
83	China	30.2
87	Lao PDR	30.0
88	Indonesia	30.0
91	Cambodia	29.6
119	Myanmar	26.8

Note: Hong Kong is not included in this survey

Source: World markets Research Centre (WMRC) 2001

<http://www.worldmarketsanalysis.com/pdf/e-govreport.pdf>

Infrastructure Developments

Infrastructure market, especially as regards bandwidth, is still experiencing high growth and looks set to continue to grow. The networking equipment market consists of four main categories - networking communications, voice communications, personal communications, and public network communications. A robust outlook for the telecommunications networking equipment market worldwide which is growing at an rate of 8.3 percent per annum is expected to reach US\$400 billion by the year 2003. By 2002, the world personal communications market is the fastest growing item which is predicted to grow to approximately US\$59 billion (Gartner 1999). Traditional public telephone infrastructure and new public data infrastructure is expected to increase by 8.8 percent per annum amounting to US\$156 billion in the same year (see Table 4). The report emphasizes that during the next five years, telecommunications monopolies will steadily move towards oligopolies, managed competition and open competition much of which will be driven by global and multinational enterprises. Meanwhile, trends are moving towards more broadband networks which will dominate the communications scene. These include integrated broadband capabilities such as real-time video streaming and conferencing and real-time digital audio and voice.

Table 4: Distribution of global spending projection on equipment network

Type of Equipment	Spending Forecast (US\$ billion)	
	1997	2002
Public wireless network	75	156
Private data network	23	59
Private voice network	48	61
Public voice network	76	69
Public data network	10	15
Other network equipment	17	49

Source: Ministry of Entrepreneurs Development 1999, Report on Global IT Usage (unpublished): Kuala Lumpur

The expansion of the global ICT market is driven by both growth in ICT usage, as described above, and the development of new ICT services. These include ICT service-providers which are now competitively developing innovative packages and many of them are beginning to penetrate the SME market. In a survey carried out by Information Week Research, 200 ICT managers of large and small companies in the USA spend an average of 20 percent of their annual ICT budgets on ICT services. In order to match customer demand for support services as well as to be innovative in creating a new mechanism for product sales, businesses, enterprises and vendors have been involved in increasing mergers and acquisitions. As the global trend of ICT is rapidly growing, competition is reaching new heights. As a result many regard ICT no longer merely as a tool of process efficiency and effectiveness, but as a determinant of survival and prosperity. In this connection, ICT decisions will be driven by the ability of vendors and information system organizations to transform cost improvements in basic technologies to business value-added tools. Likewise, the global trend in ICT is driving the primary focus of ICT investment towards value creation and business effectiveness, where a new form of dynamic enterprise will appear that uses its knowledge assets to innovate rapidly and seize market opportunities. Increased consumer access to information has also driven enterprises to focus on core competencies by which they excel and offer a broader range of products and services.

Recent high turnover in the ICT labour market provides opportunities for enterprises and businesses to employ more competent and qualified ICT professionals than before. To compete effectively, enterprises have to invest time and efforts to attract these professionals into their firms. A report noted that the annual turnover of ICT professionals in the USA and Europe have traditionally been from 6 percent to 10 percent and from 2 percent to 5 percent respectively. However, in the past two years, turnover has risen to an alarming rate of 15 percent and this trend is not expected to change for the next four to five years (Ministry of Entrepreneurs Development 2000). Last but not least, the development of networking computing activities also plays its role in the use of ICT that will steadily become the new platform for ICT application. Network computing is an evolved client/server application architecture with dynamic application deployment, execution and management. Network computing can drive down total cost of ownership in some cases, but it will be the business benefits, not the cost implications, that will drive network computing investments. Ultimately, network computing enterprises will spend more on ICT. Without network computing, however, enterprises will still spend heavily on ICT but achieve less in the long run for every dollar. This means that network computing is a reduction in the incremental cost of expanding capabilities. Nonetheless, network computing practices are still at an early stage, even though it is an emerging market. Some businesses and enterprises around the globe have already investing quite considerably in network computing technology, even though this technology is still in an early stage. This investment is expected to grow in the next few years as enterprises and businesses seek to achieve a strategic business advantage out of the current trends that will directly benefit their future revenue statistics. Indeed, the mentioned factors will have multiplier effects on businesses and enterprises and surely the ICT applications will be growing up to a point when it will suggest a note for possible caution. After this point, real use of the ICT in terms of effective e-commerce will not be automatically grow.

The Role of SMEs

SMEs have a very important role in bringing about the benefits of ICT. Just as there is a 'digital divide' amongst the population at large, so in the business world there is a divide between those firms that are firmly based on ICT utilization, and have high productivity, and those who don't have ICT, or whilst they may possess ICT do not exploit it properly (The United States Department of Commerce, 2000a). There is a further dimension to the status of SMEs in the era of e-commerce. Almost all e-commerce firms start off with few employees, even the most successful enterprises stay small in terms of employees. Therefore, many believe that within the ICT era, enterprises, including SMEs, tend to be small compared with the past, because there is a tendency to downsize their operations and outsource many functions to other firms in a network of partnerships and alliances. In the USA,

the importance of SMEs as an incubator of ideas and innovation is widely recognised (Hlava 1999). Due to this recognition, big businesses which normally use more ICT, frequently have an incentive to develop relationships with SMEs and in doing so upgrade their ICT capacity.

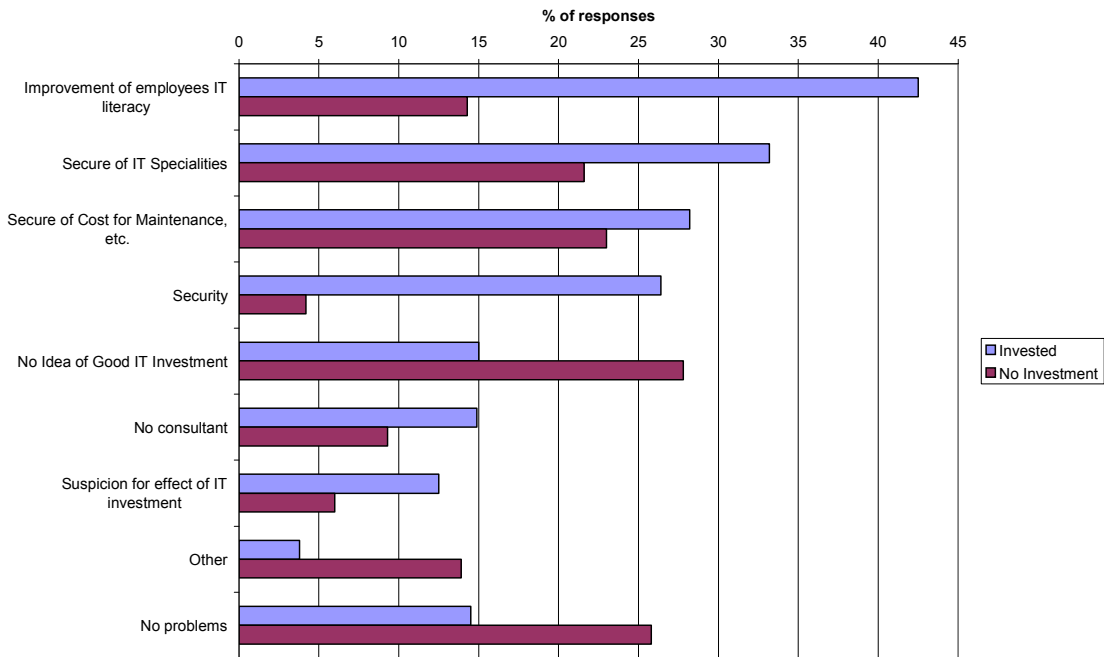
Table 5: SME’s Diffusion rate of ICT tools in Japan

IT Tools	Rate of Use (Percent)
Personal Computer	60
E-mail	60
Website	40
Network among firms via internet	20
CAD/CAM (in manufacturing)	10

Source: METI 2001

ICT usage amongst Asian SMEs varies widely. The Singapore government provides a number of incentives and infrastructure development to upgrade training and technical capabilities in upgrading the use of ICT among SMEs. Recent figures in Japan shows that SMEs are far from utilizing ICT fully – only 60% in a Ministry of Economy, Trade and Industry survey used PCs (Table 5). On the other hand, although SMEs in Japan generally recognized the need to participate in the ICT revolution they encountered problems ranging from lack of ICT skills among staff to a lack of knowledge by management of how to utilize ICT (Fig 3). If SMEs in Japan find utilizing ICT fraught with difficulties and uncertainties, what of SMEs in less developed parts of the region such as Malaysia?

Fig 3: Problems encountered by Japanese SMEs introducing ICT



Source: METI 2001:Fig 1

DEVELOPMENT OF ICT INDUSTRY IN MALAYSIA

The development of ICT usage in SMEs is very much influenced by the overall direction of the ICT industry in Malaysia as well as the advancement of global ICT trends. This is despite the fact that individual enterprises or entrepreneurs, skilled employees, size and resource of individual SMEs, vendors’ support services, type of ICT and type of industry are equally noted to be important in influencing SMEs to utilize ICT (see Moha Asri 2001). Structurally, Malaysia is intensifying her efforts to build a strong foundation for the ICT industry to achieve Vision 2020. Although the recent economic crisis has slowed down the growth of ICT industry, growth is still expected albeit at a slower pace since ICT industry revenue are closely linked to Malaysian Gross Domestic Product (GDP) trends. ICT industry revenue growth recorded a compounded annual growth rate of 22 percent from 1993 to 1997 and is projected to grow about 6.9 percent between 1998 and 2000. The ICT industry’s importance can be seen by the increase in its contribution towards GDP. On average, ICT sector has contributed about 2.8 percent to the GDP between 1994 and 1999. ICT industry’s share of GDP has increased from 2 percent to 3.4 percent between 1994 and 1997, and 5 percent in 1999. Recent trend indicates that ICT industry is

expected to outpace the GDP growth in the next three years, especially in response to the recovery of the Malaysian economy in 1999. In view of its strategic importance, the overall ICT industry growth is projected to increase rapidly from 10.8 percent 1999 to 13.9 percent 2000 and 2001 (Ministry of Finance, 2000).

In its efforts to build a strong foundation for the ICT industry, the Government of Malaysia launched a mega project known as the "Multimedia Super Corridor" (MSC) in 1995. This project provides impetus to the growth of the ICT industry and the country's economy through a number of benefits, including; development of intelligent cities with ICT and communications infrastructure such as Cyberjaya and Putrajaya areas; tax exemption for MSC status companies for 10 years or a 100 percent investment tax allowance, and unrestricted employment of knowledge workers. In addition, the National Information Technology Agenda was prepared as a framework in the development of three strategic elements of human resource, infrastructure and ICT-based application in 1996. Incentives such as removal of sales tax on computer and components as well as granting of accelerated capital allowance for expenses on computers and other ICT equipments were given to encourage the usage of ICT. In order to enhance the nation's move towards ICT strong foundation, some common laws have also been passed, in line with ICT potential that will be explored in order to reach to the fullest possible levels. These acts, among others, include Digital Signature Act 1997; Copyright (Amendment) Act 1997; Computer Crime Act 1997; Telemedicine Act 1997, and; Communications and Multimedia Act 1998 (see Ministry of International Trade and Industry 1996).

Although the ICT industry is growing fast in line with the government efforts, the industry is also hindered by the shortage of professionals and skilled human resource. During a period of 1996 –2000, it was estimated that the country's shortage of ICT staffs reached 7,063, i.e. about 75 percent of the demand were met, as stated in the Seventh Malaysia Plan 1996-2000 (Malaysia 1996). This means that the surge in demand for ICT skilled workers and professionals is exerting on the supply of ICT personnel especially in the area of networking and Internet. Ideally, high demand for ICT skills has prompted many companies to offer increasing pay to attract these personnel. As many other countries worldwide, competition for top ICT talents and entrepreneurs becomes tough. Elsewhere, the United States remains the top destination for her leading edge technology and favorable conditions. Singapore, just across the border, has always been a competitor in attracting Malaysia's talents.

Besides the shortage of human resource, another key challenge faced by the ICT industry is the lack of entrepreneurial talent in ICT. Based on a study recently, lack of entrepreneurial ICT talents impedes the development of innovative world class technology and products (Ministry of Entrepreneurs Development 1999). This is especially so for entrepreneurs in SMEs. To date, numerous efforts have been implemented to promote ICT applications in SMEs. A RM20 million fund for SMEs to participate in electronic commerce known as The Electronic Commerce Grant Scheme was, for instance, launched in 1999, as well as ICT entrepreneurial development training, infrastructure supports, technical and advisory services etc. The aim is to enable SMEs to integrate themselves into the mainstream of e-commerce, communications, and information technology as well as helping them to find a place to survive in the global marketplace (The Star July 2000). This is on top of the Malaysian Government efforts to develop a "mega" project such as Multimedia Super Corridor (MSC), to act a proxy to expand participation of local SMEs into the information technology and advanced techniques in their operation, production, marketing and distribution system. The efforts are also initiated in order to establish wider business networks between government and SMEs, SMEs and MNCs, SMEs and SMEs, locally and globally.

IMPLICATIONS OF ICT USAGE IN MALAYSIA'S SMEs

The study of ICT in Malaysia is still relatively new and does not have a long research tradition. There is no agreement on appropriate research methods to be used. However, this research study uses two main method i.e. the secondary data and documents, and primary data. The first method i.e. the secondary data and documents is essential especially when it explores the literature to identify the important variables that are found by researchers to determine the use of ICT in SMEs. It derives from a short review of literature, which indicates that there are a number of variables especially entrepreneurial characteristics, explaining the level of use of IT in SMEs. The second method is primary data based on a survey. This survey study is derived from a case study on the use and adoption of IT in SMEs in the Eastern and Northern regions of Peninsular Malaysia from June 1999 to April 2000. This means that it involves five states of Kelantan, Terengganu, Perlis, Kedah and Penang. The criteria for defining SMEs in this study as an enterprises employing full-time workers of less than 200; and the amount of paid up capital less than RM2.5 million¹². Procedures used in data collection are divided into a few phases. At the outset, the names and addresses of SMEs were compiled from a number of governmental and non-governmental agencies in Malaysia and from the five states in the two regions. Those include Small and Medium Industrial Development Corporation (SMIDEC), Federal Malaysian Manufactures (FMM), Penang

¹² This definition is widely used in Malaysia by several agencies such as World Bank 1986, UNIDO (1982) and ADB (1990), other than individual researchers such as Saleh (1989), Chee (1986), Moha Astri (1997, 1999 etc.)

Development Corporation (PDC), State Economic Development Corporation of Kedah, State Economic Development of Perlis, State Economic Development of Kelantan and State Economic Development of Terengganu.

A total of 1,512 SMEs were identified in those five states. Compiling the list of SMEs in the study area was not a simple task since there was hardly any comprehensive source where the list of all SMEs could be obtained. From 1,512 SMEs in the compiled list, about 44 percent of them could not be traced when initial visits to their respective addresses were made (867 firms). Two likely reasons for explaining these untraceable firms are; firstly, that they may have gone out of business (bankruptcies); and secondly they may have moved out from the study areas. Moreover, 116 SMEs were well known as large companies and multi-national corporations. In addition, 262 SMEs in the study area refused to cooperate or to give interviews. Therefore, only 665 were interviewed. The study was conducted in two phases i.e. a pilot study and a questionnaire survey. Eventually, only 414 SMEs were available for a questionnaire survey, while in the pilot phase, 15 SMEs were randomly chosen to do the pre-test the questionnaire. SMEs in the survey produce a wide variety of products. However, the study categorised them into four main products i.e. electrical products, food, drink and medical products, and non-food oriented products (see Moha Asri at el. 2000). The size of SMEs in the samples is relatively small in terms of their number of employees, paid up capital as well as value of output. A total of 42.0 percent of SMEs are sole proprietor, while others are private limited firms and family ownership or/and friend-ventured firms. In terms of ICT usage, out of 414 SMEs, only 7.2 percent have a high level of ICT usage and 34.8 percent have used some ICT as compared to 58.0 percent SMEs that have not used ICT at all (see Table 6). This data reflects that the level of ICT usage among SMEs tend to be higher than entrepreneurs knowledge on ICT. This may reflect that there are SMEs in the survey that use ICT, even though their owner/entrepreneurs do not have ICT knowledge. The research study also carried out a task to determine other factors contributed to ICT usage in SMEs using the Pearson Correlation and multiple regression analysis.

Table 6: The Overall Knowledge of ICT among SMEs' Entrepreneurs and the Overall Use of ICT among SMEs.

Knowledge Level	Knowledge of IT		Level of IT Usage	
	No.	Percent	No.	Percent
No Knowledge	293	70.8	240	58.0
Some Knowledge	108	26.1	144	34.8
High Knowledge	13	3.1	30	7.2
Total	414	100.0	414	100.0

The correlation matrix is presented in Tables 7 and 8. It is illustrated in two phases. Firstly the correlation between all sub-variables of ICT knowledge of entrepreneurs and the ICT use as in Table 7. Secondly, the correlation between composited score of ICT knowledge together with all other variables and the ICT use as in Table 8. Table 8 shows that ICT adoption is positively correlated with all sub variables in ICT knowledge among entrepreneurs. These include knowledge of ICT on Operating System; Microsoft Office; Lotus Application; Multimedia System; Printing Operation; Computer Hardware; Web-Page Use; Network Configuration; and Group Application Software with all at the significance level of 0.01. The findings suggest that entrepreneurs of SMEs are the key factor in determining the use of ICT. Only entrepreneurs who have more innovative would be realising and willing to improve their business efficiency and effectiveness, confirming earlier suggestion made by Howell and Higgins (1990). Entrepreneurs are the person who have a direct concern over economic feasibility and are more likely to use ICT if there is tangible economic justification in terms of costs and benefits derived.

All the sub-variables in ICT knowledge of entrepreneurs then composited into one-single score that was tested with the Cronbach alpha of over 0.70 (i.e. 0.945) meaning that the validation is highly accepted. The variable is then analysed with the other independent variables to see their correlation as illustrated in Table 8. It shows that ICT usage is positively correlated with ICT knowledge of entrepreneurs, education level of entrepreneurs, location of SMEs, budget allocated to ICT and plan for ICT expansion, number of ICT workers and total value of output and paid up capital at the significance level of 0.01 except for the total paid up capital which has a significance level of 0.05. As ICT knowledge of entrepreneurs is explained earlier, the level of education among the entrepreneurs which has positive correlation with ICT usage means that the higher the level of education, the higher the level of ICT use among SMEs. Thus, it is plausible to assume that entrepreneurs with the higher educational level tend to realise more on the benefits and economic justification for the ICT use in their firms. The finding shows that knowledge of ICT among entrepreneurs is the most important factor influencing the use of ICT, it is necessary to educate and expose entrepreneurs themselves with ICT knowledge. Location of SMEs is also positively correlated with SMEs. This correlation means that SMEs which situated in the industrial zone tend to use more ICT than the ones which are situated in the illegal and backyard areas. There is a possibility that, SMEs which located their operation in the industrial site and light industrial zone relatively bigger in terms

of size and resource of operation. Hence, they are more affordable and economically viable and justifiable to upgrade their business operations through the ICT use as opposed to SMEs located in other sites ¹³.

The analysis is further carried out using the Multiple Analysis which involves the use of the partial correlation coefficient (Pr^2). This is one of the major methods by which multiple analysis of relationship is calculated¹⁴. The partial coefficient of correlation (Pr^2) for the eleven independent variables that are used in the multiple regression analysis and their relative importance for correlation with the dependent variable are shown in Table 9 which illustrates that ICT knowledge of entrepreneurs, their level of education and skilled professionals contributed much of it¹⁵.

¹³ However, age of entrepreneurs and age of SMEs is negatively correlated with ICT use also at significance level of 0.01. This finding illustrates that SMEs with younger age appear to use ICT more than the older age. This variable may be correlated to innovative entrepreneurs at early year of business involvement, who are more likely to try out new things and take risks (Kirton 1984). In this relation, only entrepreneurs who are much younger and innovative would be willing to improve their business efficiency and effectiveness by doing things differently. The younger the entrepreneur, the higher realisation towards using ICT and more adoptive on ICT use. More interestingly, ICT use is highly correlated with ICT knowledge of entrepreneurs with the biggest score of 0.587 as compared to other variables.

¹⁴ The test allows the research study to know the strength of the independent variable in relation to dependent variable when the linear effects of other independent variables have been removed or kept constant¹⁴. All eleven variables is determined by their partial coefficient of correlation (Pr^2). The dependent variable that has the highest absolute Pr^2 is considered to be the most important variable in explaining the ICT use. A positive value for Pr^2 implies that the independent variable is positively related to the dependent variable and vice versa.

¹⁵ The Table raises several issues. First, the average of Pr^2 variable is very convincing with significant level of 99 percent. This means that most of the variables analysed in the research study explain the most substantive

Table 9: Multiple Regression Analysis for the ICT Use in SMEs.

Dependent Variable	Independent Variable	Beta	t	Significance Level
The Use of IT	- IT knowledge of Entrepreneur	.349	6.260	.000
	Level of Education	.226	4.042	.000
	Number of IT Workers	.235	4.738	.000
	Ownership Status	-.157	-3.467	.001
	Paid up Capital	.071	1.672	.096
	Age of Entrepreneurs	.102	1.915	.057
	Budget allocated for IT	.078	1.843	.066
	Value of Output	.020	0.450	.653
	Age of SMEs	.047	-1.032	.303
	Development Plan for IT	.062	1.240	.216
Percent of Variance Explain (R^2) 0.611				

Note: ***P< 0.001, **P< 0.01, *P< 0.05

part of the dependent variable. Second, from eleven independent variables analysed, average score of ICT knowledge of entrepreneurs is the most highly correlated to the ICT use with the beta score of 0.349, followed by the number of ICT workers (0.235), while level of education comes third (0.226). Other than knowledge of entrepreneurs on ICT, another variable seems to influence ICT use is employees' ICT knowledge. SMEs that have workers who are more knowledgeable on ICT are more likely to use more ICT. The finding further validates the earlier statement by Senn and Gibson (1981) who admitted that lack of knowledge and insufficient awareness of the potential benefits of ICT use among workers may also inhibit businesses from using ICT. Third, all these three variables have the significance level of $P < 0.001$ or 99 percent. Fourth, there are other variables which show the significance level of $P < 0.05$ include, paid up capital, age of entrepreneurs, budget allocated for ICT and plan for ICT development. Fifth, the total R^2 variance is 0.611 which is extremely high meaning that variables surveyed in the research study explain a significant factor for the ICT use among SMEs in Malaysia. Finally, some limitations of the research study are essential to note. As this research study was conducted in SMEs in the Northern part of Malaysia, the findings may not be appropriately generalizable to large enterprises or even SMEs in other countries with different stages of economic development and environment. The research study acknowledged that there may be other variables which, may be significant determinants of ICT use by SMEs, but were not included in the selected variables. Notwithstanding these limitations, this research study has contributed a significant factor in understanding the use of ICT in SMEs.

Table 7: Pearson Correlation Matrix on Sub-Variables of ICT Knowledge of Entrepreneurs in SMEs

Sub-Variable of Knowledge	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Operating System	1.000								
(2) Microsoft Office	.8142**	1.000							
(3) Lotus Application	.6811**	.6140**	1.000						
(4) Multimedia	.6884**	.7485**	.6948**	1.000					
(5) Printing Operation	.6587**	.7129**	.6341**	.8202	1.000				
(6) Computer Hardware	.5868**	.6359**	.6028**	.6290	.6171**	1.000			
(7) Web-page Use	.6574**	.6833**	.6335**	.6946	.6806**	.7528**	1.000		
(8) Network Configuration	.5708**	.5556**	.5999**	.6110	.5831**	.7688**	.7842**	1.000	
(9) Group Application Software	.5454**	.5699**	.6761**	.5733	.5316**	.7439**	.7368**	.8082**	1.000
(10) Group Application Software	.4341**	.4727*	.5098**	.5077	.4555**	.5028**	.5282**	.4989**	.5244**

Note: ***P< 0.001, **P< 0.01, *P< 0.05

Table 8: Pearson Correlation Matrix on all Variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Age of Entrepreneur	1.000										
(2) Entrepreneur's Education	-.5537**	1.000									
(3) Age of SME	-.3770**	.4506**	1.000								
(4) Value of Output	.4782**	-.3273**	-.2371**	1.000							
(5) Number of Worker	-.2917**	.3865**	.4165**	-.0952	1.000						
(6) Value of Paid up Capital	-.1735*	.2097**	.2238**	-.0323	-.0046	1.000					
(7) Value of Output	-.2447**	.3322**	.3773**	-.0759	.3810**	.1449**	1.000				
(8) Overall IT Knowledge	-.4562**	.6089**	.4716**	-.2822**	.3455**	.2593**	.3034**	1.000			
(9) Number of IT Workers	-.0891	.0490	.1367	-.0485	.1557*	-.0056	.1507*	.1579*	1.000		
(10) Budget Allocated to IT	-.1278	.1534*	.1056	-.1037	.1950**	.1045	.1810*	.3172**	.0639	1.000	
(11) Plan for IT Expansion	-.3312**	.4134**	.4079**	-.2077**	.4574**	.1534*	.1555*	.5045**	.1750*	.2851**	1.000
(12) Overall Use of IT	-.2504**	.4683**	.4471**	-.1943**	.4022**	.1864*	.3234**	.5868**	.2291**	.4200**	.4024**

Note: ***P< 0.001, **P< 0.01, *P< 0.05

CONCLUDING REMARKS

ICT is rapidly emerging as a key component of business practice in Asia Pacific countries. While e-commerce is the driving force in restructuring of information-intensive and service-oriented industries, the Internet is moving to the forefront of popular culture and seized great public consciousness. Many governments in the regions play a very pro-active role in developing e-commerce and ICT usage. Many of them, if not all are not only moving towards the electronic collection of customs data and duty and taxes, but more importantly ICT is also being used as a source of regulation and facilitation as well as a purchaser and supplier of goods and services. Despite the fact that Malaysia occupies a medium position among the Asia Pacific countries with a greater prospects to achieve advanced Internet connectivity rate in a couple of years, the government laid down a strong foundation for the ICT industry to grow and expand with a launch of the "Multimedia Super Corridor". This project provides great emphasis on the development of ICT and the country's economy through a range of spin-off effects. After almost eight years in its implementation, the implications on the development of SMEs and specifically the effect on the usage of ICT among Malaysia's SMEs, is hard to gauge. Through a sample survey in the study, the findings indicate that out of 414 SMEs, only 7.2 percent have a high level of ICT usage and 34.8 percent have used some ICT as compared to 58.0 percent SMEs that have not used ICT at all. The findings reflect that the actual level of ICT usage among SMEs tends to be higher than entrepreneurs' knowledge of ICT. This may mean that there are SMEs in the survey that use ICT, even though their owner/entrepreneurs do not have explicit knowledge of ICT.

In addition, SMEs that have entrepreneurs with ICT knowledge, higher level of education, employees with ICT knowledge, higher paid up capital, younger age of entrepreneurs, budget allocated for ICT and plan for ICT expansion are more likely to use ICT. In view of the findings, an effective way to promote ICT use is to cultivate greater ICT knowledge and exposure to entrepreneurs especially concerning its benefits, quality, productivity and efficiency. It could be useful too to enhance ICT knowledge to employees of SMEs to create a greater awareness among SMEs, in order to improve their overall attitude towards ICT use. This indeed could be done in a number of way such as training programmes to entrepreneurs and employees; seminars and workshops; other than providing seek capital for SMEs to enable them to purchase and meet necessary requirement. Moreover, information intensity with respect to various types of ICT and their applications to business purposes are equally essential. Therefore, providing sufficient information on the availability of ICT products, suppliers or customers, match-making procedures between the business need and the softwares and hard wares, as well as operation system are also crucial. A specific agency dealing with these requirements and needs would be highly desirable.

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