Information and Communication Technology (ICT) for development of small and medium-sized exporters in East Asia: Singapore

Wong Poh Kam

Annette Singh

NACIONES UNIDAS

CEPAL

UNDP

IDE-JETRO

Comisión Económica para América Latina y el Caribe (CEPAL)

United Nations Publication

Contents

Abstract

The rapid economic expansion of Singapore was achieved through continuous industrial re-structuring and upgrading. In this process, the IT revolution played a prominent role in the rapid industrialization of Singapore. Government efforts at providing infrastructure, investment incentives, education and training incentives, and setting an example by itself being a lead user of IT, helped Singapore to achieve a high level of IT diffusion. This is particularly evident in the public sector and in large companies; however, small and medium sized enterprises (SMEs) tend to lag somewhat in their knowledge and adoption of IT. This report discusses the trends of IT usage by local SMEs in Singapore, and uses case studies to highlight the potential that exists for SMEs that are willing to invest substantial resources in appropriate IT. Policy measures taken by the government to assist SMEs in their business and IT development are also discussed.

I. Introduction

Singapore has achieved impressive economic growth since independence in 1965 (annex-table 1). In 2002, Singapore's per capita GDP stood, on a Purchasing Power Parity (PPP) basis, at over US$23,000 (WEF, 2004). In 1965, Singapore's PPP-adjusted per capita income was less than 16% of that of the USA; as recently as 1980, it was still less than 50% (Wong, 2003).

The rapid economic expansion of Singapore was achieved through continuous industrial re-structuring and upgrading. In the first decade after independence, growth was led largely by labour-intensive manufacturing. In the two subsequent decades it was propelled by the rapid technological upgrading of manufacturing. The development of Singapore into an increasingly important business, financial, transport, communications services hub in the Asia Pacific region provided additional engines of growth (annex-table 2). Nevertheless, manufacturing has remained important to the economy up till today, with its share of GDP remaining above 25% for most years in the last two decades.

The IT revolution played a prominent role in the rapid industrialization of Singapore (Wong & Singh, 2002). Government efforts at providing infrastructure, investment incentives, education and training incentives, and setting an example by itself being a lead user of IT, helped Singapore to achieve a high level of IT diffusion. This is particularly evident in the public sector and in large companies; however, small and medium sized enterprises (SMEs) tend to lag somewhat in their knowledge and adoption of IT.

This report discusses the trends of IT usage by local SMEs in Singapore, and uses case studies to highlight the potential that exists for SMEs that are willing to invest substantial resources in appropriate IT. Policy measures taken by the government to assist SMEs in their business and IT development are also discussed.

II. Present situation of IT market and IT usage by SMEs

A. Market estimates

One indication of the size of the market for computer hardware in Singapore is available from the Yearbook of World Electronics Data. Table 1 shows that the Singapore market for computer hardware has grown fairly consistently from US$1.2 billion in 1988 to its current size of US $5.7 billion. The only two periods in which we see negative growth in the market were the two recessions: 1998 (the Asian financial crisis) and the recent recession in 2001. Both of the downturns were quite severe, with growth contracting by about one third each time. Consequently, the average compound annual growth rate for the market in 1988-1995 (23.7%) is much higher than for 1995-2002 (0.6%).

TABLE 1
MARKET SIZE FOR COMPUTER EQUIPMENT IN SINGAPORE, 1998-2002
(In millions of U.S. dollars and percentages)

	US$ million	CAGR (%)
1988	1 244	n.a.
1989	1 846	48.4
1990	2 210	19.7
1991	2 582	16.8
1992	2 872	11.2
1993	3 471	20.9
1994	4 090	17.8
1995	5 504	34.6
1996	6 794	23.4
1997	7 614	12.1
1998	5 274	-30.7
1999	6 377	20.9
2000	8 002	25.5
2001	5 355	-33.1
2002	5 730	7.0
Growth rate:		
1988-1995	23.7	
1995-2002	0.6	

Source: Yearbook of World Electronics Data 1990-2004, Elsevier.

Statistics on the market for IT software and services in Singapore are not so readily available. The closest and most comprehensive source is the InfoComm Development Authority (IDA), which conducts regular surveys on IT usage in businesses and in households. IDA's Annual Survey on InfoComm Usage in Households and by Individuals 2003 found a high rate of penetration, with 73.7% of Singapore households owning personal computers (either desktops or laptops), and 64.6% having access to the Internet (figure 1) (IDA 2004). Almost two thirds of the population (62.6%) use computers, while about half use the Internet and a much lower proportion (42%) use broadband.

FIGURE 1
HOUSEHOLD IT PENETRATION IN SINGAPORE 2003
(In percentages)
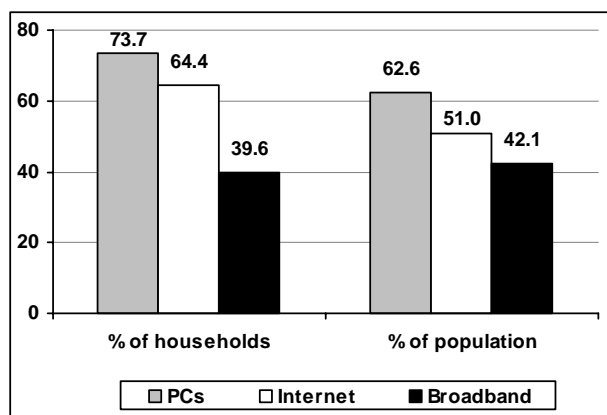
Source: Executive Summary for Annual Survey on InfoComm Usage in Households and by Individuals for 2003, InfoComm Development Authority (IDA), 2004, downloaded from IDA website, <http://www.ida.gov.sg/idaweb/doc/download/I2908/ HH_Executive_Summary_(Final)_14062004.doc>

By far the most frequent use of the Internet is for e-mail (91.9% of Internet users aged 15 years and above), followed by online information searches (64.1%), and chatting and downloading/playing online games (48%) (table 2).

The use of the Internet for online shopping is very low. Only 20% of Internet users (aged 15 and above) made purchases online. Moreover, the growth of online purchasing has been almost stagnant among households for the last three years, being 18.3% in 2001 and 21.2% in 2002 (figure 2). In addition, the number and value of purchases has fallen. In 2002, the average number of online purchases was three, and the average dollar spending was $651. This fell to two purchases, with an average value spent of $336 the subsequent year. The main reason for not purchasing goods online is a preference for visiting the physical shops for variety and to check prices (38.1% of Internet users aged 15 and above who have never shopped or bought online) and a lack of perceived necessity (25.9%).

Thus not only is the market for household e-commerce fairly small in Singapore, but the growth potential appears to be limited.

TABLE 2
USAGE OF INTERNET APPLICATIONS AND SERVICES
(In percentages)

Internet applications and services	Users aged 15 years and above	
	2002	**2003**
E-communications		
E-mail	95.4	91.9
Chat/instant messaging	52.5	47.5
Video conferencing	8.3	11.3
Internet SMS	30.8	38.5
Internet telephone telephony	8.8	12.8
Discussion groups	22.8	23.0
E-transactions		
Online banking	27.4	32.6
Online investments/securities	9.7	8.4
Online insurance services	6.4	5.0
Online government related transactions	42.1	42.2
Online shopping	21.2	20.0
Non-monetary e-transactions		
Upload & download documents from office server	28.4	36.8
Online job search/job application	26.9	31.2
Online information retrieval/search	59.3	64.1
Online library services	22.1	29.9
Download application software	44.9	43.1
Creating online personal home page	13.3	15.5
E-entertainment		
Download/play online games	44.0	48.4
Audio streaming/download and/or upload music	41.8	37.1
Video streaming/download and/or upload video	31.1	27.5
Download and/or upload digital photos	32.2	34.1
Online contest/competitions	19.8	20.9
E-learning		
E-learning or online education	15.7	29.8
Children educational content (e.g. online assessment)	11.3	17.0

Source: Executive Summary for Annual Survey on InfoComm Usage in Households and by Individuals for 2003, InfoComm Development Authority (IDA), 2004, downloaded from IDA website, <http://www.ida.gov.sg/idaweb/doc/download/I2908/HH_Executive_Summary_(Final)_14062004.doc>
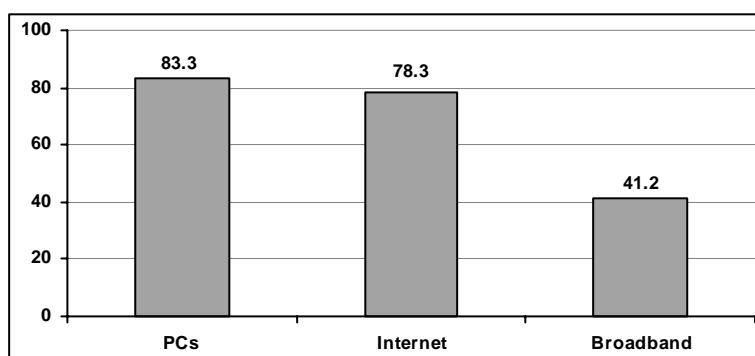
FIGURE 2
ONLINE SHOPPING IN SINGAPORE 2000-2003
(In percentages)
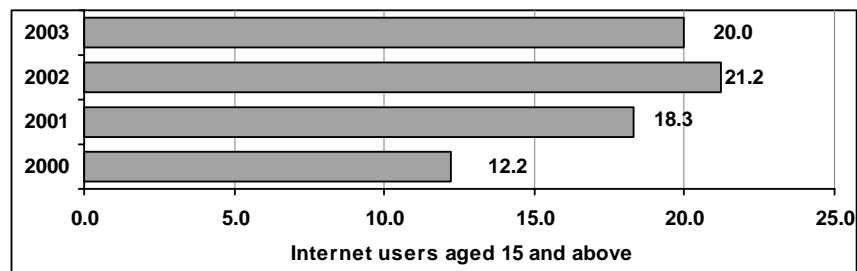
Source: Executive Summary for Annual Survey on InfoComm Usage in Households and by Individuals for 2003, InfoComm Development Authority (IDA), 2004, downloaded from IDA website, <http://www.ida.gov.sg/idaweb/doc/download/I2908/HH_Executive_Summary_(Final)_14062004.doc>

11

The market for IT in companies, as revealed in IDA's Annual Survey of InfoComm Usage in Business 2002, is discussed in detail in the next chapter, comparing SME IT usage with that of larger companies. As such, we will not go into it in much detail here. Briefly, we can see that the overall level of computer penetration is higher than in households (83.3% of companies and 75% of employees in 2002), as is the level of Internet usage (78.3% of companies and 73.5% of employees) (figure 3). However, a substantial proportion of organizations that do use information and communication technology (ICT) only use basic technologies such as personal computers (PCs) and the Internet; many have not progressed to using more sophisticated technologies. Of those that have, established technologies such as Internet/extranet and LAN/WAN predominate. Singapore companies have been much slower to adopt new, cutting-edge technologies such as smart-card technology and virtual private networks (VPN) (NUS, 2003) (see figure 4).

FIGURE 3
IT PENETRATION IN THE SINGAPORE PRIVATE SECTOR 2002
(In percentages)

Source: Annual Survey of InfoComm Usage in Business 2002: Final Report, prepared by National University of Singapore (NUS), for InfoComm Development Authority of Singapore, May, 2003.

FIGURE 4
USAGE OF DIFFERENT FORMS OF IT IN THE SINGAPORE PRIVATE SECTOR
(In percentages)
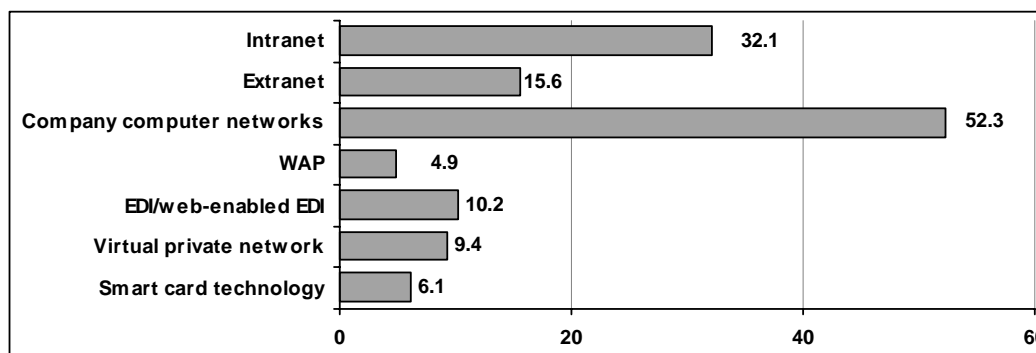
Source: Annual Survey of InfoComm Usage in Business 2002: Final Report, prepared by National University of Singapore (NUS), for InfoComm Development Authority of Singapore, May, 2003.

In 2002, most companies using IT spent relatively small amounts (less than S$50,000) on IT during the year, most of which went to hardware, software and telecommunications. Moreover, most organizations using IT do not plan to change their expenditure. It seems that IT adoption by companies in Singapore is reaching a plateau, as almost all businesses that perceive the need, or have the desire to adopt IT, have already done so. Future market growth would then come mainly from IT users that wish to deepen their IT usage.

E-commerce usage has increased substantially in the private sector, however. In 2002, 31.5% of Internet users used e-commerce compared to 19.6% in 2000 (figure 5). Most of this increase came from companies engaging in e-commerce as customers. The proportion of Internet-using companies that conducted e-commerce as customers doubled from 13.5% in 2000 to 26.5% in 2002, while those using e-commerce as suppliers only increased from 11.7% to 15.8%. Usage of e-commerce in the private sector in Singapore is higher in the non-manufacturing sectors, particularly in IT services, health and financial intermediation. The most common e-commerce activities are online purchasing and receiving orders online. That is, organizations commonly start their transactions using e-commerce but do not complete them online.

FIGURE 5
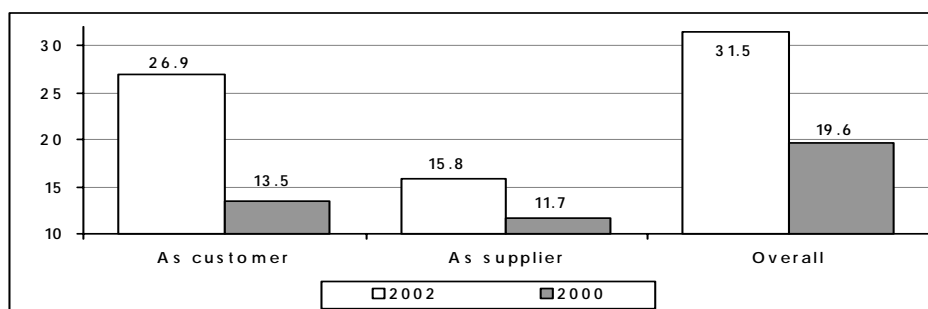**E-COMMERCE USAGE IN THE SINGAPORE PRIVATE SECTOR**
(In percentages)

Source: Annual Survey of InfoComm Usage in Business 2002: Final Report, prepared by National University of Singapore (NUS), for InfoComm Development Authority of Singapore, May, 2003.

A quarterly e-commerce survey for Q1-Q3 in 2001 estimated Singapore's business-to-business (B2B) and business-to-consumer (B2C) sales revenue to be $112 billion and $2.6 billion respectively for the full year 2001 (IDA 2002). That B2C sales revenue is much lower than for B2B is consistent with the finding from the household survey that consumers prefer to go to physical shops rather than doing their shopping online. It is also to be expected, given Singapore's small domestic market and efficient transportation system (Wong and Ho, 2003). Most growth in e-commerce in Singapore will have to come from B2B e-commerce. Nevertheless, Singapore companies received a higher proportion of their revenue from B2C (16%) and B2B (18%) than Australia, Hong Kong (China), Taiwan (Province of China) and the Republic of Korea in Q2 and Q3 of 2001.

Broadband access in Singapore companies is relatively high (41.2% of organizations in 2002 [figure 3]), but about one third of these are using dedicated leased lines of less than 2mbps rather than more sophisticated technologies. Moreover, the majority of those with broadband access use it for fairly simple purposes, such as online research and internal communications (NUS, 2003).

13

Usage of wireless technologies is very limited. Most companies using ICT (75.5%) do not use wireless LAN and have no plans to do so in the next 12 months (figure 6). The corresponding figure for general packet radio service (GPRS) is 88%. Again, the main reason for those that do not use wireless technologies is a lack of perceived need.

FIGURE 6
USAGE OF WIRELESS TECHNOLOGIES IN THE SINGAPORE PRIVATE SECTOR
(In percentages)
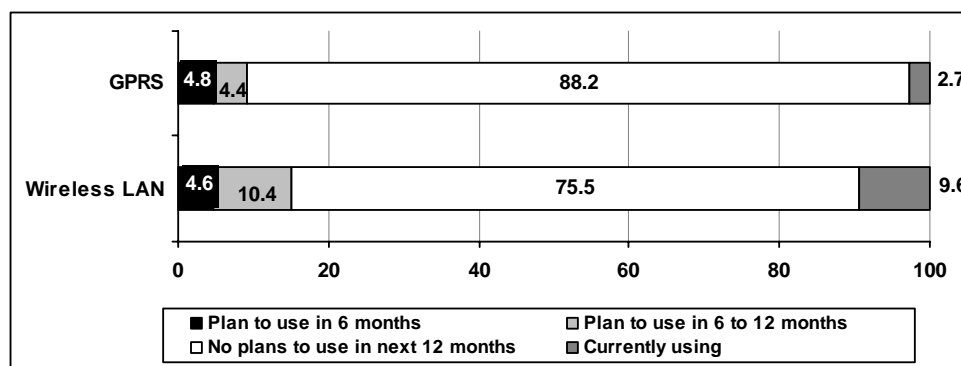
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

- Summary

It is clear that IT penetration in Singapore households and businesses is high. Further growth in the market, then, will come mainly from existing users upgrading or extending their IT, rather than from new users. This is especially true of the private sector, where there is a high level of usage of basic information technologies, but companies have been much slower to adopt newer forms of technology. The level of e-commerce, as measured by proportion of sales revenue, is also high compared to other countries in the region. There is scope for growth in e-commerce in Singapore, but it will mainly come from B2B e-commerce, given that Singapore's small size and shopping convenience lowers consumers' desire and perceived need for shopping online.

B. Penetration of IT and e-commerce by SMEs

In this study, we adopt the same definition for SMEs as that used by the Singapore government, that is those firms having a net fixed asset investment of less than $15 million and fewer than 200 employees. Since our interest is confined to local entities, we have an additional condition that they must have more than 30% local ownership.

1. Usage of basic forms of IT

IDA's survey of InfoComm usage in business in 2002 showed, not surprisingly, that SMEs tend to lag behind large companies in their adoption and knowledge of IT, especially in the more advanced forms of IT. This is true when comparing SMEs to both local and foreign large companies, although the difference is usually more pronounced with the latter.

For the most common forms of IT however, SME usage levels are almost equivalent to large companies. Survey results showed that SMEs have a high level of computer usage, with 84% using PCs, workstations and laptops (figure 7). By comparison, all large companies, local and foreign, use computers.

14

FIGURE 7
IT PENETRATION IN SINGAPORE BY FIRM STATUS
(In percentages)
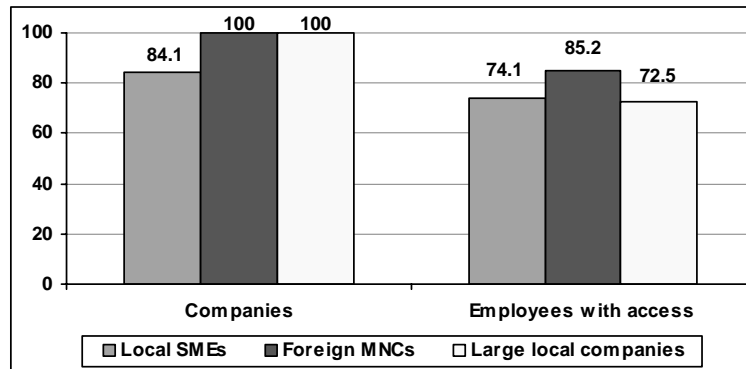
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Similarly, a high proportion of employees (three quarters) in SMEs have access to computers. This is less than for those in foreign companies (85%), but about the same as for those in local large companies (72%).

2. ICT usage sophistication and diversity

An indication of the diversity of IT usage by SMEs and the sophistication of the level of technology readiness in SMEs is given by the Index of InfoComm Sophistication. The Index measures the extent to which organizations deploy a range of technologies: intranet, extranet, company computer networks (e.g. local area networks [LAN], wide area networks [WAN]), wireless application protocol (WAP), EDI/web-enabled EDI (electronic data interchange), virtual private network and smart card technology. It ranges from 0 to 7, and is a count of the number of different technologies that is used in organizations. Hence, the higher the Index (i.e. the closer it is to 7), the more sophisticated the level of technology readiness and the more diversified the company's use of IT.

SMEs[1] in Singapore have a relatively low level of IT sophistication, having a Sophistication Index of 1.1, significantly lower than local and foreign large companies (2.5 and 2.8 respectively) (figure 8).

FIGURE 8
INDEX OF INFOCOMM SOPHISTICATION BY FIRM STATUS
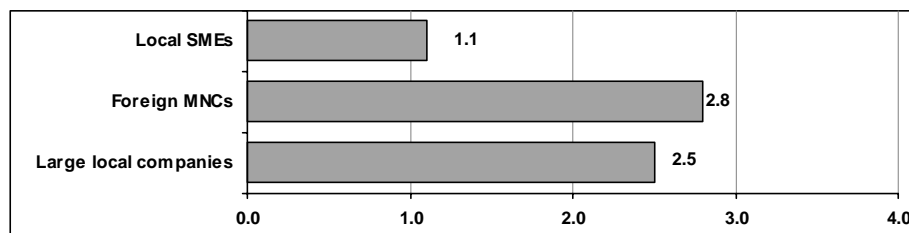
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.
Note: Welch ANOVA: Difference is significant at 1% level.

---

[1]   For the rest of this chapter, figures will refer to companies that already use IT, unless otherwise stated.

Of all these forms of IT, the most prevalent in SMEs is computer company networks (48% of companies), followed by intranet (28%) and extranet (14%) (figure 9). For these, SMEs are quite a long way behind large companies. For example, about 80% of large companies use company computer networks and about 65% use intranets. Few SMEs use the other types of IT, with only about 5%-6% using WAP, EDI, virtual private networks or smart card technologies. Again, for these technologies SMEs are quite far behind large companies, except for WAP, which is uniformly rarely used.

FIGURE 9
CURRENT USAGE OF DIFFERENT FORMS OF IT BY FIRM STATUS
(In percentages)
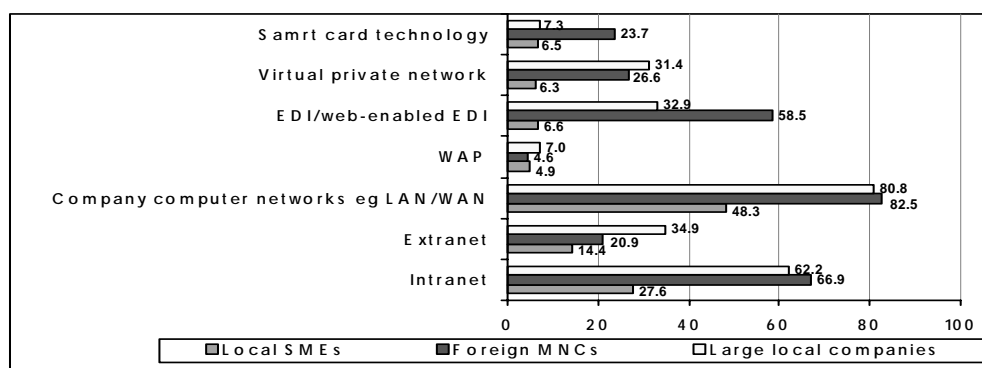
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

There is also limited scope for growth in usage of these technologies amongst SMEs, with only about 5% planning to adopt any of them within the next year (figure 10). By contrast, a much higher proportion of large companies plan to adopt these technologies, especially foreign large companies. For example, 26% of foreign large companies plan to implement virtual private networks, 19% plan to implement extranets, 16% company computer networks, and about 11% WAP and smart card technology. The exception to this pattern was EDI, which only 1% of foreign large companies plan to adopt.

FIGURE 10
PLANNED USAGE OF DIFFERENT FORMS OF IT BY FIRM STATUS
(In percentages)

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

3. IT expenditure

The average SME spent an average of $32,000 on IT in 2002, much lower than the spending of local large companies ($1.2 million) and foreign large companies ($856,000). It should be noted that this lower level of spending is not merely because SMEs are smaller in size and so have fewer resources to spend on IT. The average foreign SMEs spent $74,000 on ICT in 2002, more than double that of local SMEs.

SMEs spend the bulk of their ICT budgets (73%) on hardware and software (figure 11). Very little is spent on external InfoComm services and InfoComm manpower (8% and 6% respectively). In this, they are very similar to local non-SMEs, whereas foreign non-SMEs spend a much greater proportion of their ICT budgets on outsourced ICT activities (21%) and on their ICT manpower (16%).

FIGURE 11
DISTRIBUTION OF IT EXPENDITURE BY FIRM STATUS
(In percentages)

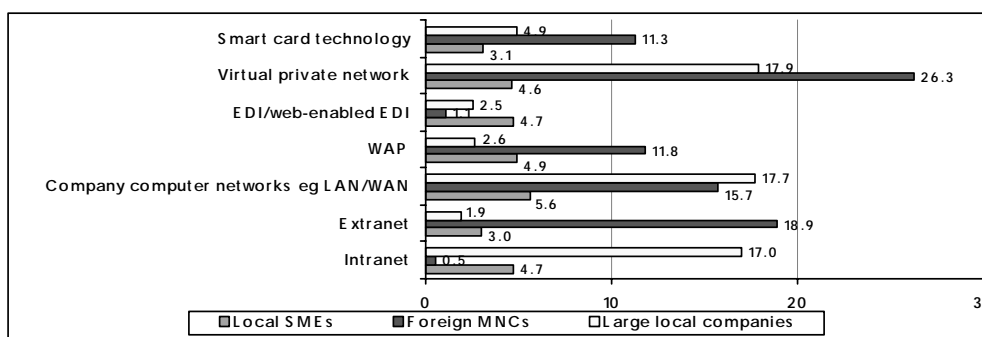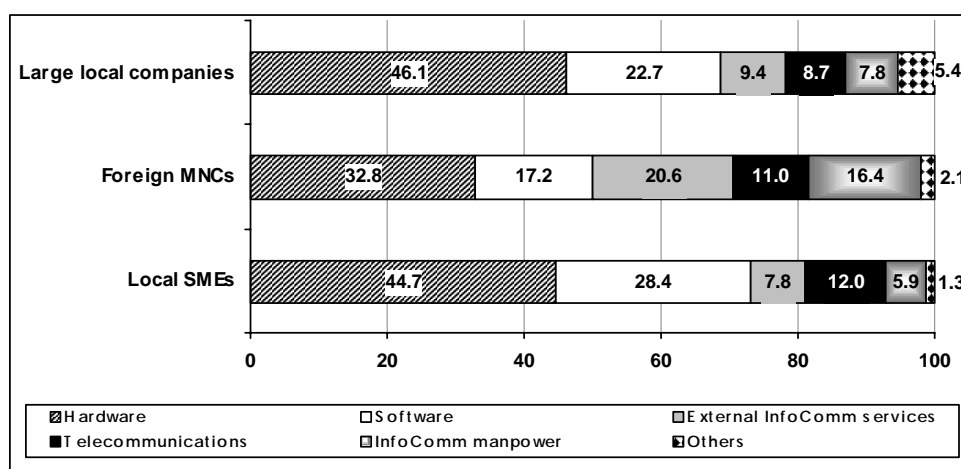**Source:** Calculated from Annual Survey of InfoComm Usage in Business 2002.

4. Motivations and benefits of IT usage

From the SMEs' perspective, there are multiple factors that would motivate them to use IT. All the potential benefits listed in the survey were considered to have almost equal importance: reducing costs, gaining access to customers; improving customer service and increasing efficiency by streamlining internal business processes and improving productivity (figure 12). Gaining access to new customers and improved customer service is significantly more important to SMEs than to local large companies, and improving efficiency/productivity is more important to SMEs than to foreign multinational corporations (MNCs). By contrast, large companies tend to see cost reduction as a particularly important potential benefit of using IT.

FIGURE 12
IMPORTANCE OF POTENTIAL OR REALIZED BENEFITS OF USING IT BY FIRM STATUS
(In scale of importance from 1 up to 5)
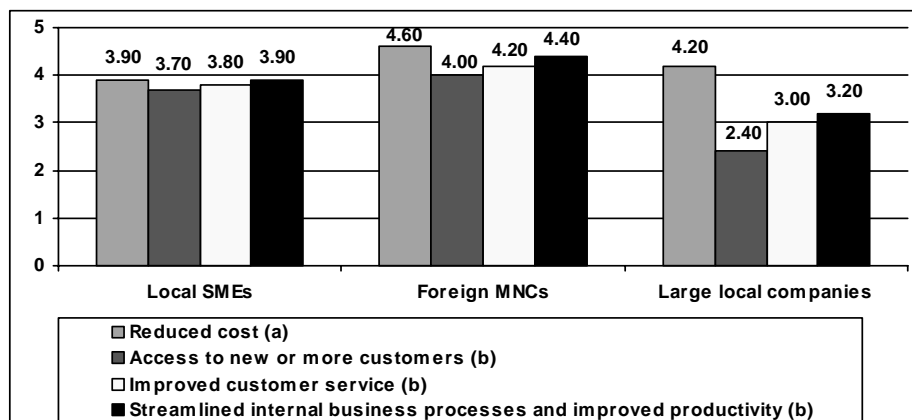
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Level of importance on a scale of 1 to 5, where 1 = not at all important and 5 = extremely important.
(a) ANOVA: Difference is significant at 5% level.
(b) ANOVA: Difference is significant at 1% level.

Nevertheless, the most important factor SMEs consider in the adoption of new information technology is its affordability, along with a conviction that the new technology will benefit the company (table 3). The need for financial assistance specifically targeting SMEs is reflected in the fact that the availability of such assistance is rated as significantly more important by SMEs than by local large companies. Foreign large firms are less concerned with the cost of technology. For them, the ease of adoption reflected in the availability of technical assistance and training of employees is relatively more important.

TABLE 3
IMPORTANCE OF FACTORS AFFECTING DECISION TO ADOPT NEW IT BY FIRM STATUS
(In scale of importance from 1 up to 5)

	Local SMEs	Foreign MNCs	Large local companies
Affordability	4.13	3.51	3.83
Availability of financial assistance[a]	3.92	3.83	2.97
Convinced of benefit	4.08	4.43	3.84
Desire to be early mover/ leader	2.76	2.83	2.42
Reaction of others in industry	2.89	2.87	2.61
Availability of technical assistance[bd]	3.65	4.03	3.24
Familiarity[cd]	3.67	3.96	3.37
Training of employees[ad]	3.49	4.04	3.32
Availability of results of pilots and trials on commercial viability[b]	3.15	3.74	2.66
Ability to be customized	3.38	3.43	3.36

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Mean score calculated on a scale of 1 to 5, where 1 = not at all important and 5 = extremely important.
[a] ANOVA: Difference is significant at 1% level.
[b] ANOVA: Difference is significant at 5% level.
[c] ANOVA: Difference is significant at 10% level.
[d] Welch ANOVA test statistic has been used.

5. Management of IT activities

SMEs have a greater tendency to manage their ICT activities wholly in-house, than large companies, especially foreign large companies (figure 13). Sixty-three percent of SMEs keep their IT activities entirely in-house, compared to 55% of local large firms and only 31% of foreign large companies.

FIGURE 13
MODE OF MANAGING IT ACTIVITIES BY FIRM STATUS
(In percentages)
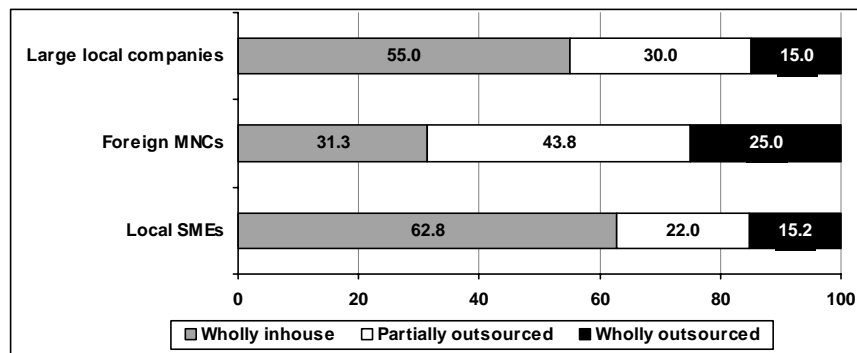
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

6. Usage of ASPs and web services

Absolute levels of ASP (application service provider) usage by SMEs is somewhat low, with only 10% currently making use of them, and the vast majority (84%) having no plans to do so within the next 12 months (figure 14). However even at these levels, SMEs are more advanced than local large companies, only 5% of which are using ASPs. ASP usage is more prevalent in foreign large companies (13% currently using ASPs). SMEs are among those with the highest potential growth for ASPs, with 6% planning to use ASPs within a year, compared to 5% of local large companies and 0% of foreign large companies.

FIGURE 14
USAGE OF ASPS BY FIRM STATUS
(In percentages)
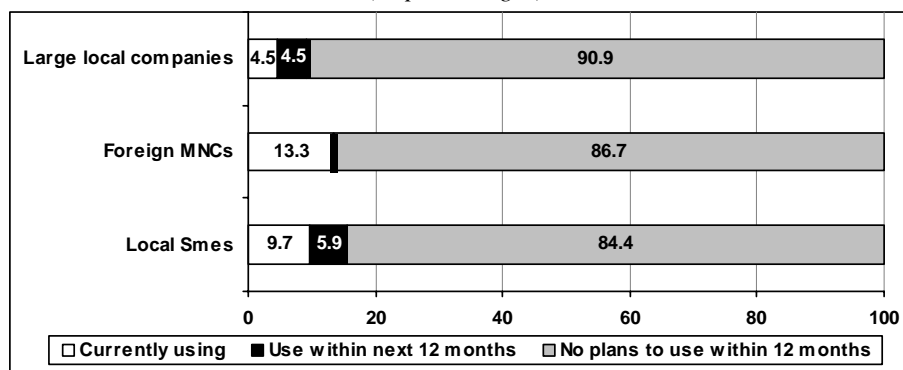
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

The greatest benefits for SMEs in using ASPs are gaining access to the latest technologies and upgrades and obtaining cost savings (figure 15). This points to a potentially important role for ASPs in helping SMEs stay abreast of technology. The advantage that firms gain from subscribing to ASPs is particularly relevant for SMEs, which have fewer resources available to keep up to date with changes in technology and to procure and implement them. This is reflected in the fact that SMEs rated this benefit of using ASP as significantly higher than did large companies.

FIGURE 15
IMPORTANCE OF POTENTIAL OR REALIZED BENEFITS OF USING IT BY FIRM STATUS
(In scale of importance from 1 up to 5)
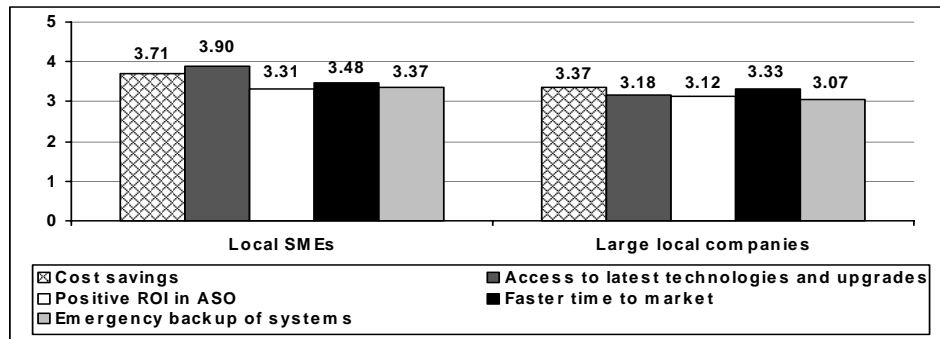
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Local large companies and MNCs have been combined into one category due to the small number in both groups for this question. Mean score calculated on a 5-point scale where 1 = not at all and 5 = to a large extent, rated by companies using IT and currently using ASP.

Conversely, SMEs which do not use ASPs cited their ignorance as one main reason (figure 16), pointing to the need to educate SMEs about the availability and benefits of using application services providers. Other important concerns were the cost of using ASPs, and a preference for retaining in-house control over IT applications. Local non-SMEs that do not use ASPs had reasons similar to SMEs, while foreign non-SMEs were mainly concerned with the possibility of problems in integrating ASP applications with other applications and the cost of ASPs.

FIGURE 16
REASONS FOR NOT USING ASP BY FIRM STATUS
(In scale of importance from 1 up to 5)
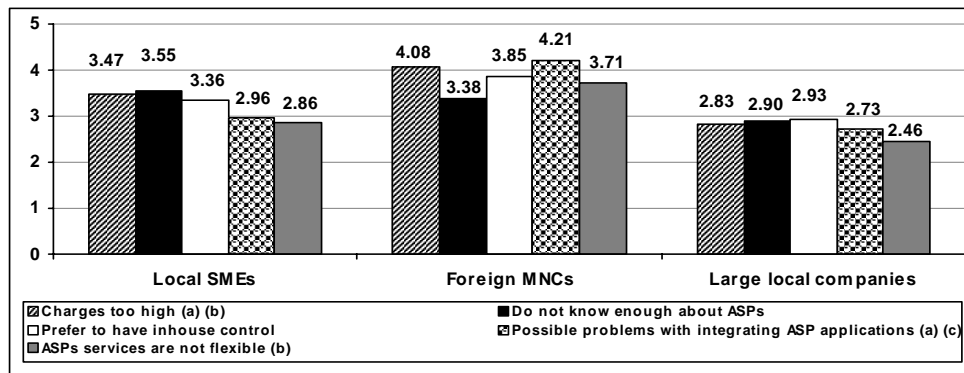
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Mean score calculated on a 5-point scale where 1 = not at all and 5 = to a large extent, rated by companies using IT but not using ASP.

[a] Welch ANOVA test statistic has been used. [b] ANOVA: Difference is significant at 5% level.

  [c] ANOVA: Difference is significant at 1% level.

   Local SMEs have a relatively low level of usage of web services (7%) compared with foreign and local large firms (13% and 18% respectively) (figure 17). The opportunities for growth in this area for SMEs are somewhat greater than for ASPs, with 10% of SMEs planning to embark on web services within one year.

FIGURE 17
USAGE OF WEB SERVICES BY FIRM STATUS
(In percentages)
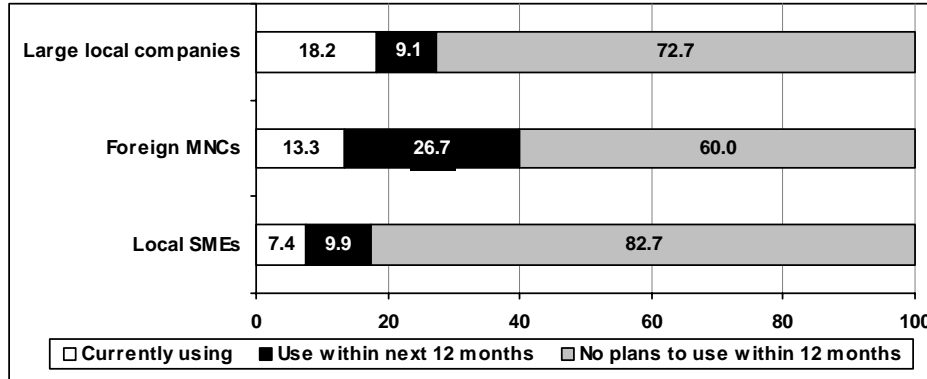
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

7. Usage of the Internet

The overwhelming majority of SMEs (94%) use the Internet, and 72% of employees have access to the Internet (figure 18). Surprisingly, although large companies have a higher Internet penetration rate (all of them have Internet access), they give their employees less exposure to the Internet. Only 57% of employees in local non-SMEs and 65% in foreign non-SMEs have Internet access.

FIGURE 18
INTERNET PENETRATION IN SINGAPORE BY FIRM STATUS
(In percentages)
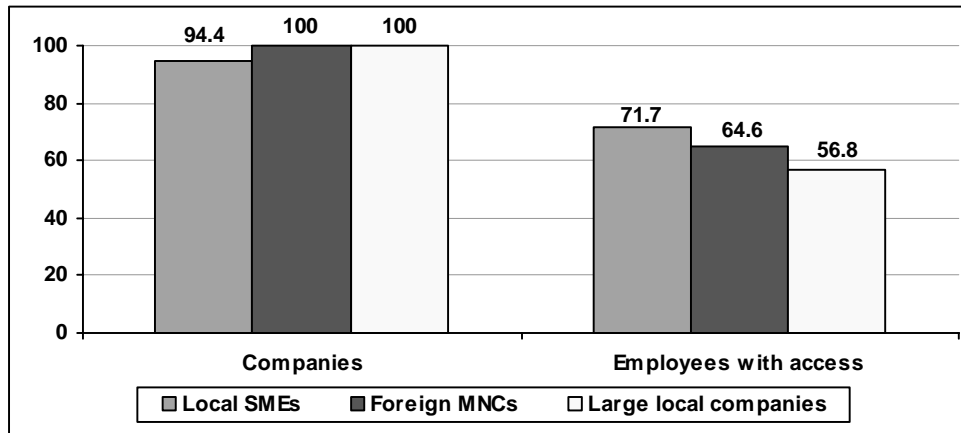
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

For those companies that already use the Internet, or plan to do so, the key motivating benefits are gaining access to information and improved communications (figure 19). This is true for both SMEs and large companies. SMEs also see the Internet as a means to raise their profile, rating more effective marketing and higher visibility as significantly more important benefits than did large local companies.

FIGURE 19
IMPORTANCE OF BENEFITS IN MOTIVATING INTERNET USAGE BY FIRM STATUS
(In scale of importance from 1 up to 5)
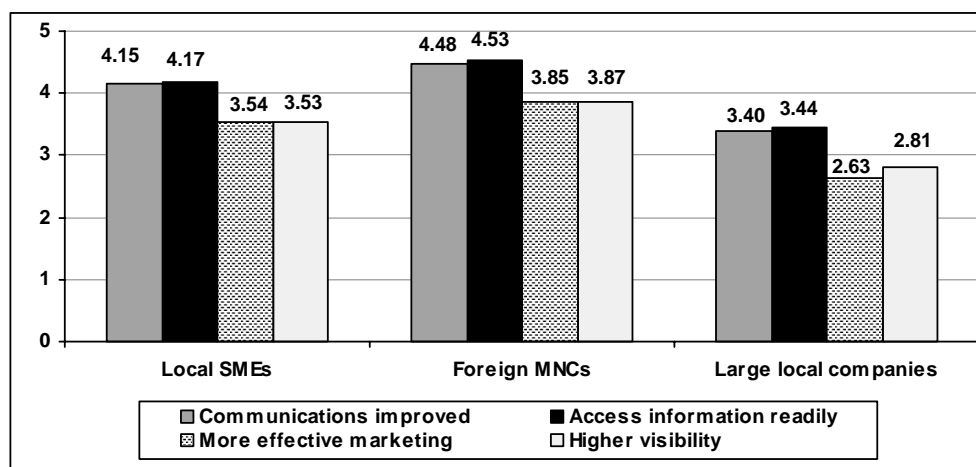
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.
**Note:** Mean score calculated on a 5-point scale where 1 = not at all important and 5 = extremely important, rated by companies using the Internet.

The most common forms of Internet use by SMEs are information search (98% of SMEs with Internet access), e-mail (99.9%) and exchanging electronic files (88%) (table 4). A smaller proportion (about 46%) also uses the Internet for purposes such as advertising/marketing, providing information on their own websites, and accessing supplier databases. Overall, foreign non-SMEs have a greater propensity to use the Internet for a wider variety of purposes, such as eliminating steps in production/distribution with suppliers and customers and Internet telephony. However, SMEs in turn tend to be more sophisticated in their Internet usage than local large companies, with a greater proportion of SMEs using the Internet for purposes such as accessing the databases of customers and suppliers, education and training (including e-learning), manpower recruitment, selling goods over the Internet, providing information on their websites, advertising/marketing, and automating processes with customers and suppliers.

TABLE 4
PURPOSE OF INTERNET USAGE BY FIRM STATUS
(In percentages)

	Local SMEs	Foreign MNCs	Large local companies
Email	99.9	98.5	87.2
Information searches	98.4	99.5	90.3
Exchanging electronic files	88.3	99.4	52.5
Advertising/ marketing	46.8	38.2	27.3
Provide info on own Website	46.5	41.2	23.9
Accessing databases of suppliers	45.6	83.3	27.5
Purchasing goods and services	40.8	40.5	42.8
Selling goods and services	35.2	56.3	24.4
Accessing databases of customers	31.8	52.5	23.1
Recruitment and staffing	27.3	40.5	20.3
Education/ training/ E-learning	26.3	39.4	11.6
Sharing or performing collaborative research and development	20.1	45.5	27.0
Automate or eliminate steps with customers	16.9	35.0	12.2
Automate or eliminate steps with suppliers	14.1	37.0	12.3
Internet telephony	7.0	27.9	18.2

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

8. Usage of e-commerce

SMEs engage in e-commerce much less than large companies (31% of Internet users compared to 80% for foreign large companies and 50% of local large companies) (figure 20). Those that do engage in e-commerce are more likely to use it for buying rather than for selling. SMEs with Internet access using e-commerce as customers account for 27.3% of the total, but only 14% use e-commerce as suppliers.

FIGURE 20
E-COMMERCE USAGE BY FIRM STATUS
(In percentages)
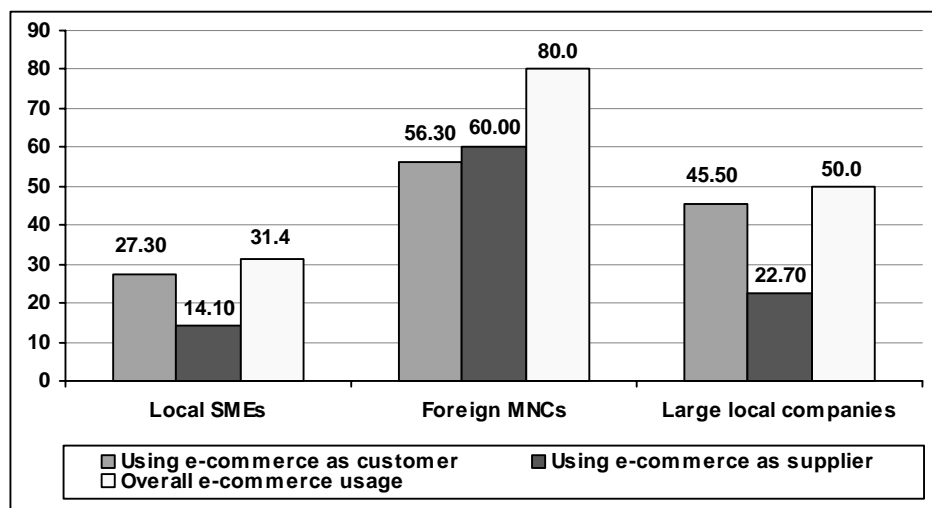
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

23

Awareness of e-commerce online best practices is limited. Only about one third of SMEs using e-commerce are aware of online best practices in areas such as secure infrastructure, online trade financing and online payment, compared to about two thirds of foreign non-SME e-commerce users (figure 21). However, SMEs have a higher level of awareness of payment and trade financing best practices than do local non-SME e-commerce users, of which only about one quarter are familiar with best practices in this area. The reverse is true for e-commerce infrastructure, with 47% of local large companies that engage in e-commerce being aware of this.

FIGURE 21
AWARENESS OF ONLINE BEST PRACTICES BY FIRM STATUS
(In percentages)
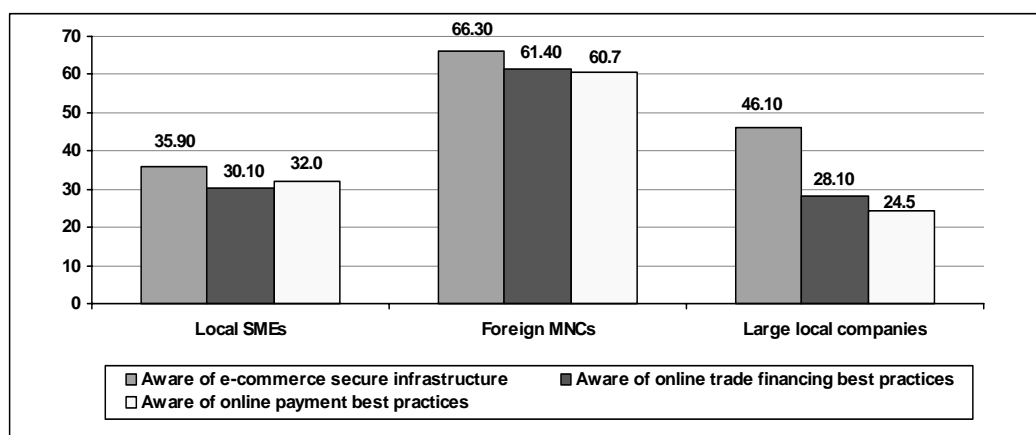
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

However, when it comes to adoption of online best practices, SMEs lag far behind. None of those that use e-commerce have adopted secure infrastructure or trade financing best practices and only 0.1% has adopted online payment best practices (table 5). This may partially reflect a trend in industry —only about 2% of foreign large companies that use e-commerce have adopted best practices. However, this is not true across the board. Local large companies have a higher rate of best practices adoption; although only 1% of local non-SMEs that use e-commerce have adopted online trade financing best practices, 4% have adopted best practices in payment, and 8% have adopted e-commerce secure infrastructure.

TABLE 5
ADOPTION OF ONLINE BEST PRACTICES BY FIRM STATUS
(In percentages)

	Local SMEs		Foreign MNCs		Large local companies	
	Plan to adopt	Already have	Plan to adopt	Already have	Plan to adopt	Already have
E-commerce secure infrastructure	21.4	0	55.6	1.5	33.1	7.9
Online trade financing best practices	21.6	0	53.7	1.7	24.4	1.1
Online payment best practices	19.6	0.1	53.0	1.9	21.7	4.1

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

One factor mitigating SMEs' failure to implement best practices is their high level of intent to do so. About 20% of SME e-commerce users plan to adopt a form of online best practices. This also follows a general trend in the private sector, with the proportion of e-commerce-using large companies that intend to adopt e-commerce best practices being even higher (about 25-30% for local non-SMEs and about 55% for foreign non-SMEs).

SMEs lag behind large companies in the types and range of security services used in their e-businesses. Content screening/anti-virus services and firewalls/gateways are the most common forms of security services, used by about 55% of SME e-commerce users (figure 22). By contrast, over 90% of large companies use these security services. Moreover, large companies are more likely than SMEs to deploy a variety of security services in their e-business. Between 20-40% of large companies that engage in e-commerce, use methods such as intrusion detection and VPN/IP (Internet protocol) security infrastructure, compared to about 10% of SMEs. Similarly, between 10%-20% of e-commerce using large companies use rating services/credibility certification, compared to only about 3% of SMEs.

FIGURE 22
DEPLOYMENT OF SECURITY SERVICES BY FIRM STATUS
*(In percentages)*
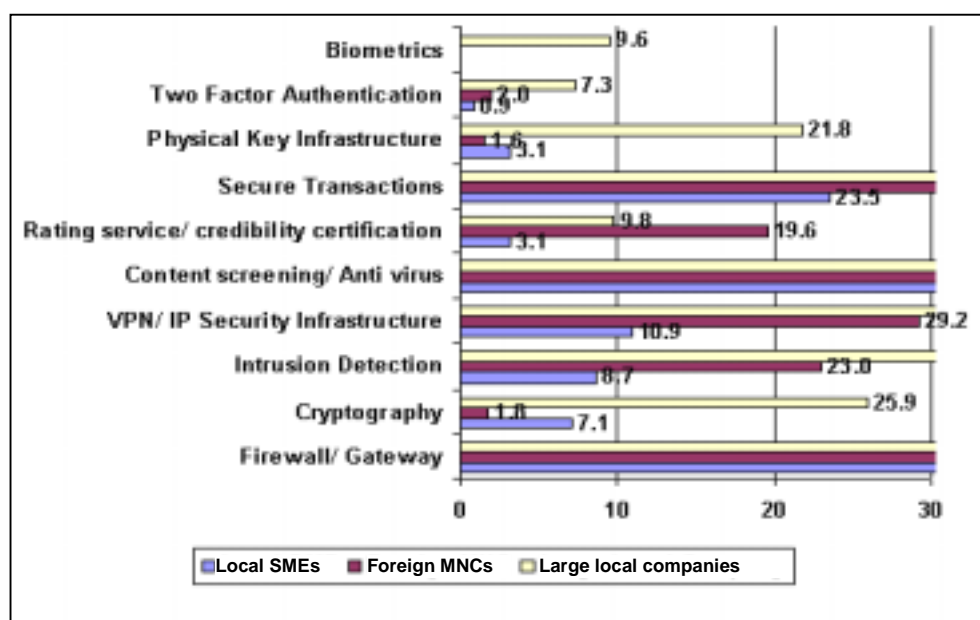
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

SMEs in Singapore are decidedly lukewarm about whether the government's policy and regulatory framework is conducive to e-commerce. Only 10% of those using e-commerce agreed that the government's regulations and policies are conducive to e-business, while an almost equal number (8%) said that it is not, and an overwhelming majority (82%) was not sure (figure 23). They are not alone in their ambivalence. None of the large local companies could say whether the government's policies are conducive or not. Foreign large companies were also mainly undecided (70%), and while 10% think Singapore has an environment conducive to e-business, twice that number said definitively that it does not.

FIGURE 23
PERCEPTION OF SINGAPORE'S POLICY AND REGULATORY
FRAMEWORK BY FIRM STATUS
(In percentages)

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

9. Usage of broadband technologies

Although almost half (48%) of Singapore's Internet-using SMEs have broadband access, broadband penetration of these firms is substantially lower than in large companies (64% for local non-SMEs and 100% for foreign non-SMEs) (figure 24). However, the proportion of employees in SMEs that have broadband access is the same as for the large companies (about 75%).

FIGURE 24
BROADBAND PENETRATION IN SINGAPORE BY FIRM STATUS
(In percentages)
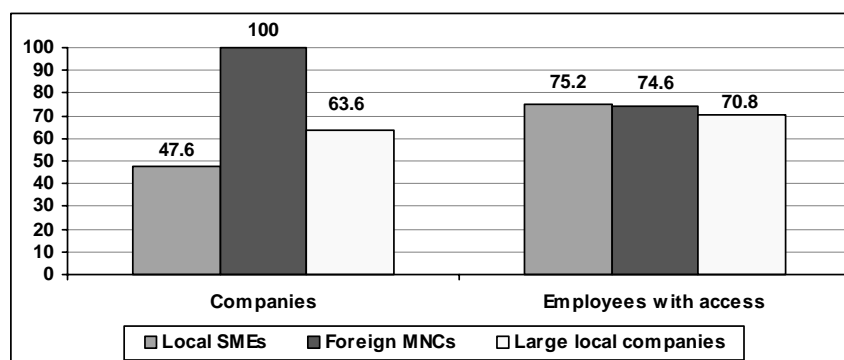
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Only a small proportion of SMEs' ICT budgets are spent on broadband services such as video-streaming, video-conferencing and broadband hosting/hubbing. Thirty percent of those with broadband access spend less than 5%, and another one quarter do not spend anything at all (table 6). This can be compared to large companies, where about 40% of those with broadband spend less than 5% of their ICT budgets on broadband services, and one quarter do not spend anything. However, a greater proportion of SME broadband users spend a larger share of their ICT budgets on broadband services. Four percent spend more than 40% of their budgets on such services. None of the large companies are in this category. Moreover, there is significant potential for growth in broadband usage by SMEs. One third of those, with broadband access, plan to increase their broadband expenditure in the next two years (although this potential growth is slightly offset by the 9% that plan to reduce their broadband spending).

26

TABLE 6
PERCENTAGE OF IT EXPENDITURE SPENT ON BROADBAND
SERVICES BY FIRM STATUS
(In percentages)

Percentage			Local SMEs	Foreign MNCs	Large local companies
0			23.8	26.7	28.6
Less than 5			29.5	40.0	42.9
5	to	10	23.8	6.7	7.1
11	to	20	7.0	6.7	21.4
21	to	30	7.4	20.0	0
31	to	40	4.5	0	0
41	to	50	2.5	0	0
More than 50			1.6	0	0
Total			**100**	**100**	**100**

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

SME broadband users are most likely to use broadband for fairly simple uses, such as online research and internal communications (about 50% of SME users) (figure 25). Using broadband as a platform to deliver content, for marketing/promotion, and to access multimedia applications and collaborative tools such as file sharing is also relatively common (about 40-45% of SME users). Aside from these, usage of broadband for more sophisticated purposes such as e-commerce (16%), e-learning (18%), and as an alternative marketing/distribution channel (23%) is less common amongst SMEs. Telecommuting and global video conferencing are the least common uses for broadband for SME broadband users (10% and 7% respectively).
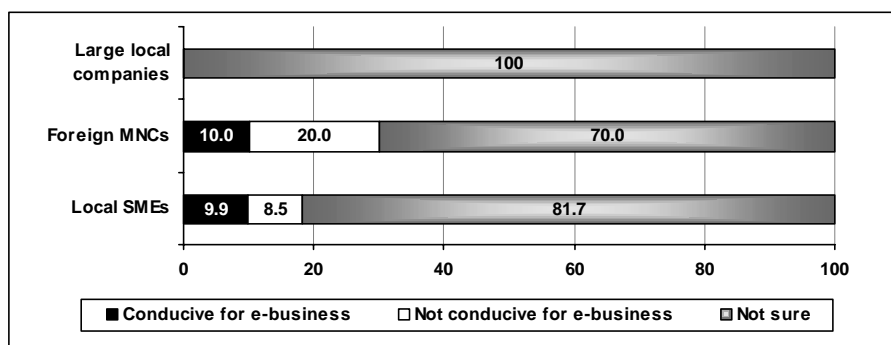

FIGURE 25
PURPOSE FOR USING BROADBAND BY FIRM STATUS
(In percentages)
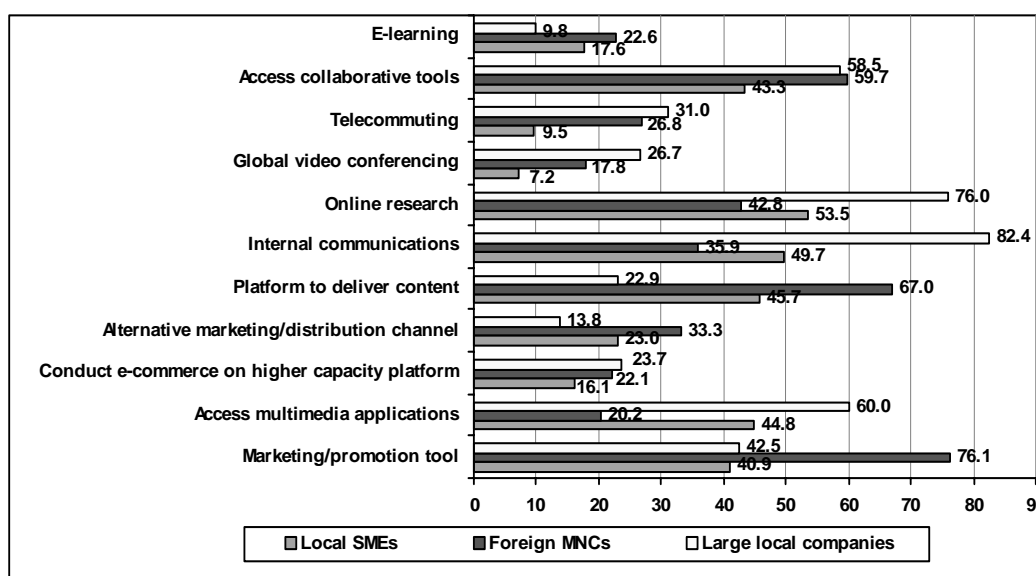
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Large companies have a greater propensity to use broadband for a wider variety of purposes than SMEs, encompassing both simple and sophisticated uses. However, as with SMEs, local large companies are most inclined to use broadband for internal communication and online research (82% and 76% of local non-SME broadband users respectively), whereas foreign large companies most commonly use it as a marketing/promotion tool and for content delivery (76% and 67% of foreign non-SME users respectively).

SME broadband users are fairly well informed about available broadband services. Most (about 70%) are aware of services such as broadband hosting, video streaming and video conferencing, although fewer are familiar with rich media creation and integrated data communications (IDC) services (41% and 21% respectively) (figure 26).

Not surprisingly then, the most commonly used broadband service is broadband hosting (23% of SME broadband users) (figure 27). Video conferencing and streaming are much less frequently used (10% and 6% respectively), while only a small minority use rich media creation and IDC services. SMEs' use of broadband services is generally on a par with that of large companies, although local large companies far outstrip them in the use of video conferencing (30% of local non-SMEs with broadband access).

At the other end of the spectrum, about twice as many SMEs use broadband hosting than either local or foreign large companies. There is also significant potential for growth in the use of broadband services among SMEs. About 10% of SME broadband users that are not currently using services such as broadband hosting, video conferencing, video streaming, rich media creation and IDC services, plan to do so within the following year.

FIGURE 26
AWARENESS OF BROADBAND SERVICES BY FIRM STATUS
(In percentages)

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

FIGURE 27
USAGE OF BROADBAND SERVICES BY FIRM STATUS
(In percentages)
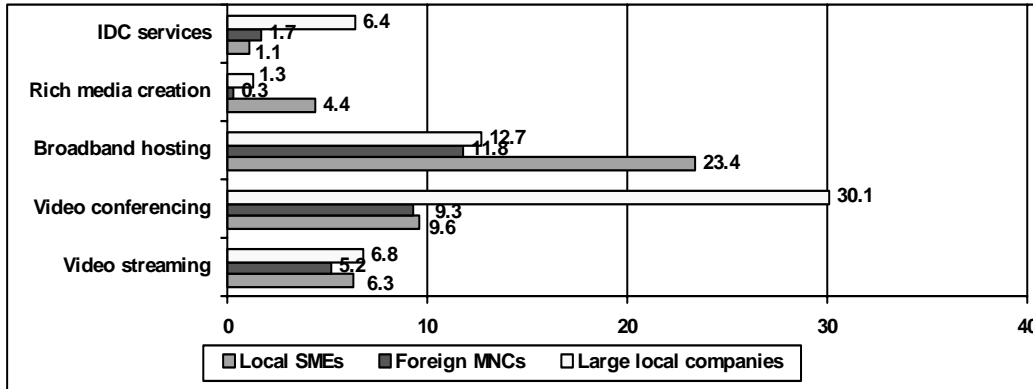
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Increased productivity is the most commonly cited benefit of broadband services for SMEs (81% of those with broadband access) (figure 28). Lower cost and overheads and faster turnaround and time to market are also widely perceived benefits. These are similar to the benefits cited by large companies; with foreign large companies most commonly mentioning increased productivity and faster turnaround time, while local large companies cited lower costs and developing more innovative products and services.

FIGURE 28
PERCEIVED BENEFITS OF USING BROADBAND SERVICES BY FIRM STATUS
(In percentages)

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

SMEs are also in tandem with large companies in perceiving reliability and stability as the most important considerations when deciding whether to adopt broadband services and applications, followed by affordability (table 7). Given the greater resource constraints experienced by SMEs, it is not surprising that affordability is a significantly more important concern for them than for foreign MNCs.

TABLE 7
IMPORTANCE OF FACTORS AFFECTING DECISION TO ADOPT BROADBAND
APPLICATIONS AND SERVICES BY FIRM STATUS
(In scale of importance from 1 up to 5)

	Local SMEs	Foreign MNCs	Large local companies
Reliability	4.50	4.73	4.41
Stability	4.50	4.51	4.49
Affordability[a]	4.37	3.66	4.19
Ease of adoption or use	4.23	4.01	4.00
Potential value adding	4.07	4.03	4.16
Time taken to set up[bc]	3.90	4.03	3.40
Innovativeness and uniqueness to differentiate from competitors	3.52	3.75	3.67

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Mean score calculated on a 5-point scale where 1 = not at all important and 5 = extremely important, rated by companies with broadband access.

[b] ANOVA: Difference is significant at 5% level.

[a] ANOVA: Difference is significant at 1% level.

[c] Welch ANOVA test statistic has been used.

Most SMEs that have Internet access but do not currently have broadband access, do not subscribe because they see no need to do so. Nevertheless, there is a growing demand for broadband services and applications among SMEs, with almost half (45%) of those that do not currently have broadband planning to subscribe within the following year.

10. Usage of wireless technologies

Only a minority of SMEs (10%) currently use wireless LAN, and three quarters have no plans to do so in the next year (figure 29). Again, in this respect SMEs lag somewhat behind foreign large companies (14%) but are more advanced than local large companies (5%). Interestingly though, SMEs are the most advanced wireless LAN users, being the only group of companies in Singapore that use it for purposes other than for basic services such as Internet, intranet and e-mail access. Nine percent of SME wireless LAN users use it for specific workflow or other applications.

FIGURE 29
USAGE OF WIRELESS LAN BY FIRM STATUS
(In percentages)

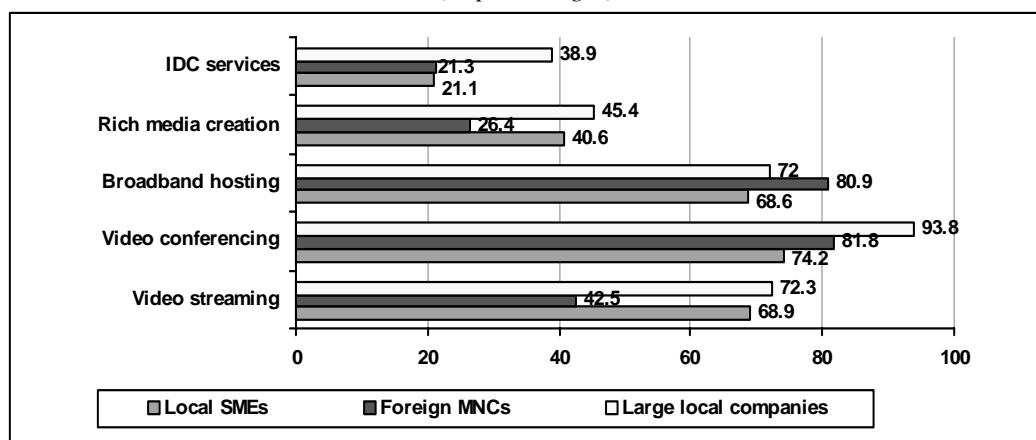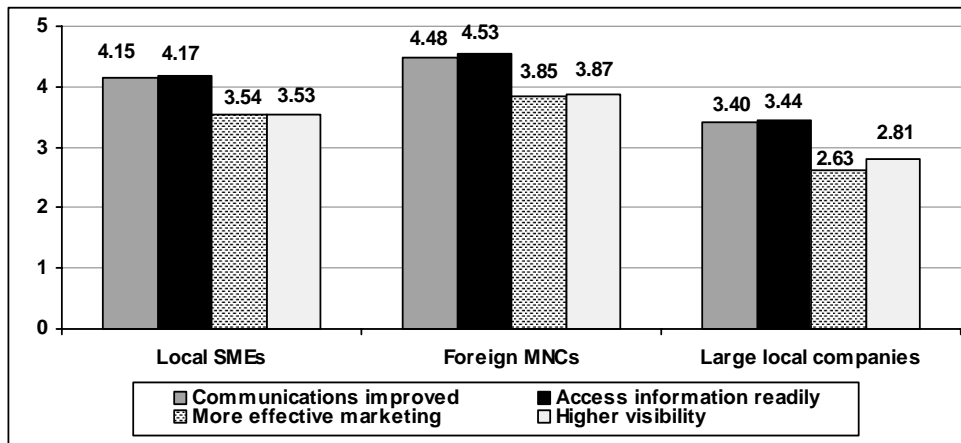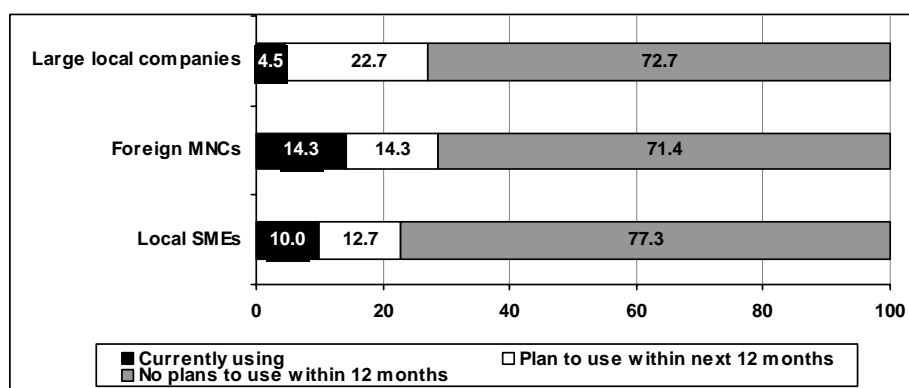**Source:** Calculated from Annual Survey of InfoComm Usage in Business 2002.

Although few SMEs are currently using, or planning to use, wireless LAN, they do see it as having wide potential/actual applications in their organizations, in functions ranging from admin/HR to operations/logistics and R&D[2] (figure 30). This stands in contrast to foreign non-SMEs, which most commonly see wireless LAN as having applications mostly in information systems, marketing/sales, logistics and finance.

FIGURE 30
AREAS OF APPLICATIONS FOR WIRELESS LAN BY FIRM STATUS
(In percentages)

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Usage of GPRS is even less common than wireless LAN (used by 3% of SMEs) (figure 31). As with the other advanced forms of IT, there is some growth potential, with another 7% planning to use GPRS within the following 12 months. SME usage of GPRS is less pervasive than in local large companies, with 5% of local non-SME Internet users currently using such technology and 18% planning to adopt it within the next year. By contrast, none of the foreign non-SMEs currently use GPRS, nor are they planning to do so in the near future.

FIGURE 31
USAGE OF GPRS BY FIRM STATUS
(In percentages)
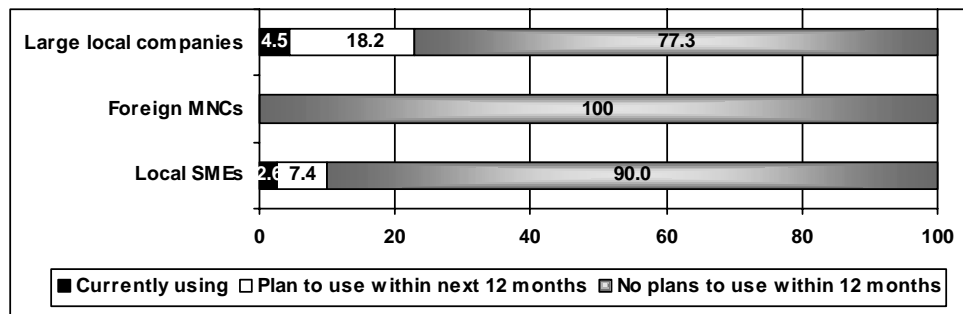
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

---

2   The most commonly cited are information systems, marketing/sales and administration.

Given the space constraints faced by many SMEs, it is not surprising that they cite optimization of office space (e.g. the ability to work anywhere in the office compound) as the most relevant benefit they see from using wireless technology (figure 32). The ability to provide better customer service and a reduction in turnaround time were also very relevant benefits.

FIGURE 32
RELEVANCE OF BENEFITS ACHIEVABLE THROUGH USAGE OF
WIRELESS TECHNOLOGIES BY FIRM STATUS
(In scale of importance from 1 up to 5)
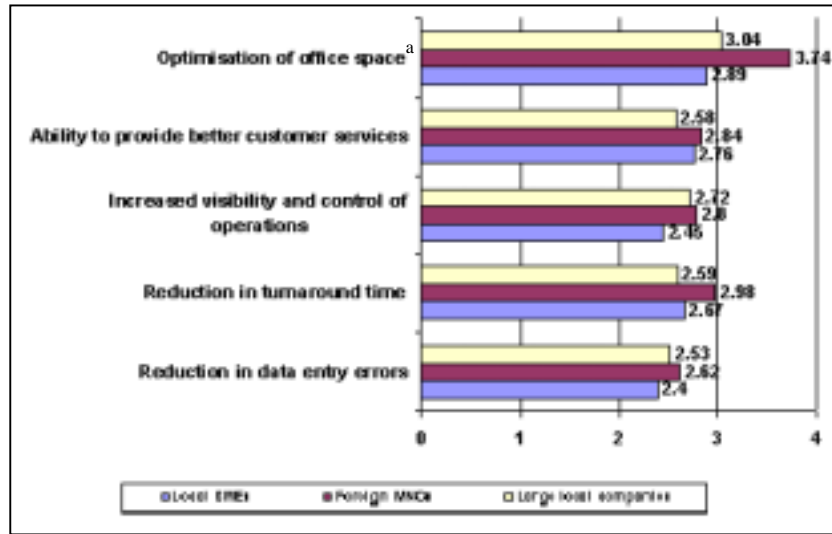
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.
Note: Mean score calculated on a 5-point scale where 1 = not at all relevant and 5 = extremely relevant, rated by companies using IT.
[a] ANOVA: Difference is significant at 10% level.

A larger proportion of SMEs (17% of ICT users) believe they need off-site wireless access to the Internet or their corporate LAN compared to non-SMEs (9% for local companies and 13% for foreign companies) (figure 33). Their preferred location for off-site wireless access is cafes, restaurants and hotels.

FIGURE 33
NEED FOR OFF-SITE WIRELESS ACCESS TO INTERNET OR
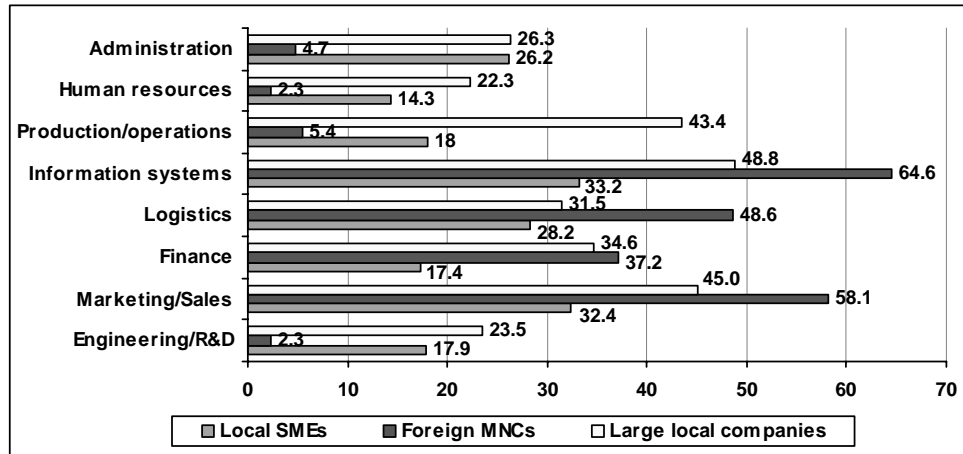**CORPORATE LAN BY FIRM STATUS**
(In percentages)
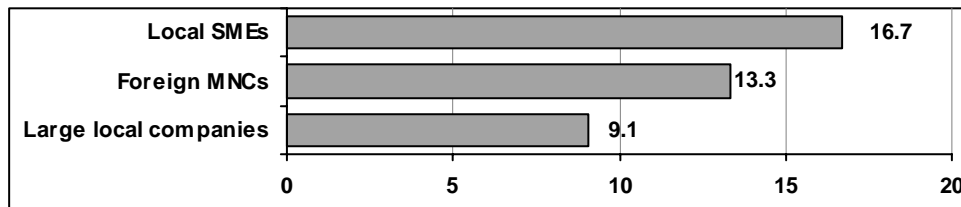
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Cost concerns are not uppermost in preventing SMEs from adopting wireless technologies, but rather their concerns over the compatibility of technologies with their organization. Acceptance of the new technology by their workforce and changes needed to existing business procedures and workflows were cited as the most important barriers preventing SMEs from implementing wireless technologies (table 8). These are significantly greater hindrances for SMEs than for large companies, which are more concerned with the applicability and cost of the technologies, and the ability to reap tangible benefits from them.

TABLE 8
BARRIERS TO ADOPTION OF WIRELESS TECHNOLOGIES BY FIRM STATUS
(In scale of importance from 1 up to 5)

	Local SMEs	Foreign MNCs	Large local companies
Concerned with acceptance of new technologies[a][b]	3.82	2.88[d]	
Changes needed to existing procedures and workflows++	3.69	3.35	2.38
Cost of wireless device	3.21	2.63	3.71
Applicable but no tangible benefits from deployment	3.08	3.45	3.83
Cost of recurrent wireless service charges	3.06	3.80	2.61
Not aware of capabilities of wireless technologies	2.97	3.09	2.42
Security concerns[a][b]	2.46	1.37	2.04
Cost of initial investments[a][c]	2.44	3.05	3.22
Not applicable to business needs[b]	2.22	3.66	2.77

Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Mean score calculated on a five-point scale. Respondents were asked to select and rank top five barriers where 1 = most important barrier and 5 = fifth most important barrier, rated by companies using IT.
[a] Welch ANOVA test statistic has been used.
[b] ANOVA: Difference is significant at 1% level.
[c] ANOVA: Difference is significant at 10% level.
[d] Local large companies and MNCs have been combined into one category due to the small number in both groups for this question.

11. Impact of IT usage

Only a minority of SMEs reports reaping tangible benefits from IT usage. Forty-one percent of SMEs using IT had an increase in domestic sales, 30% reported an increase in overseas sales and 44% reported a reduction in their manpower costs (figure 34). This stands in contrast to foreign large companies using IT, of which 60-80% report improvements in these areas. Local large companies, however, benefited less from ICT than SMEs did, with only 20-30% reporting improvements.

FIGURE 34
PROPORTION OF COMPANIES CITING TANGIBLE BENEFITS OF
IT USAGE BY FIRM STATUS
(In percentages)
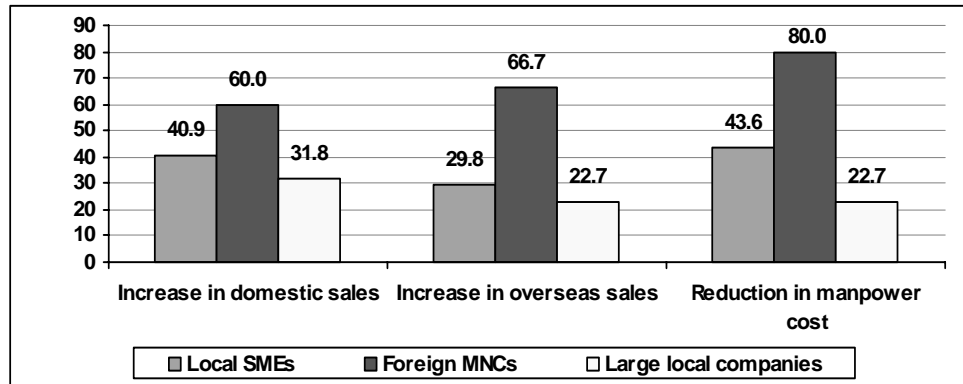
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

12. Perceptions and attitudes towards IT

As expected, SMEs (including IT users and non-users) cite cost as their main concern about using IT (figure 35). Security issues, technical problems (such as systems breakdowns) and the difficulty of keeping pace with changes in technology are also important concerns. The cost of IT and security issues, along with obtaining skilled employees, are also the top concerns for foreign MNCs, although the latter rate these issues as being of significantly more concern to them than do SMEs.

FIGURE 35
PERCEPTIONS OF ISSUES PERTAINING TO IT USAGE BY FIRM STATUS
*(In scale of importance from 1 up to 5)*
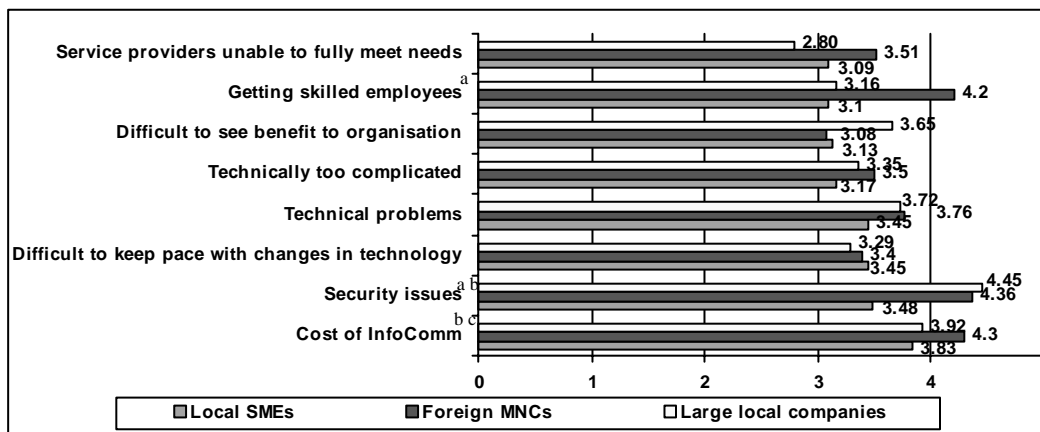
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.

Note: Mean score calculated on a 5-point scale where 1 = not at all concerned and 5 = extremely concerned.
[c] ANOVA: Difference is significant at 5% level.
 ANOVA: Difference is significant at 1% level.
[b] Welch ANOVA test statistic has been used.

Given that cost is their overriding concern, it is not surprising that SMEs see financial grants and assistance as the most effective measure for encouraging the use of IT technologies, followed by assistance in skills and knowledge acquisition (figure 36). However, they are less optimistic about the efficacy of these measures in boosting IT usage than the foreign MNCs. Although SMEs generally agreed these measures would be effective (mean scores were about 3.5 on a scale of 1 (not at all effective) to 5 (extremely effective)), they gave them significantly lower effectiveness ratings compared to the MNCs (mean scores of about 4.3).

FIGURE 36
EFFECTIVENESS OF MEASURES TO ENCOURAGE IT USAGE BY FIRM STATUS
(In scale of importance from 1 up to 5)
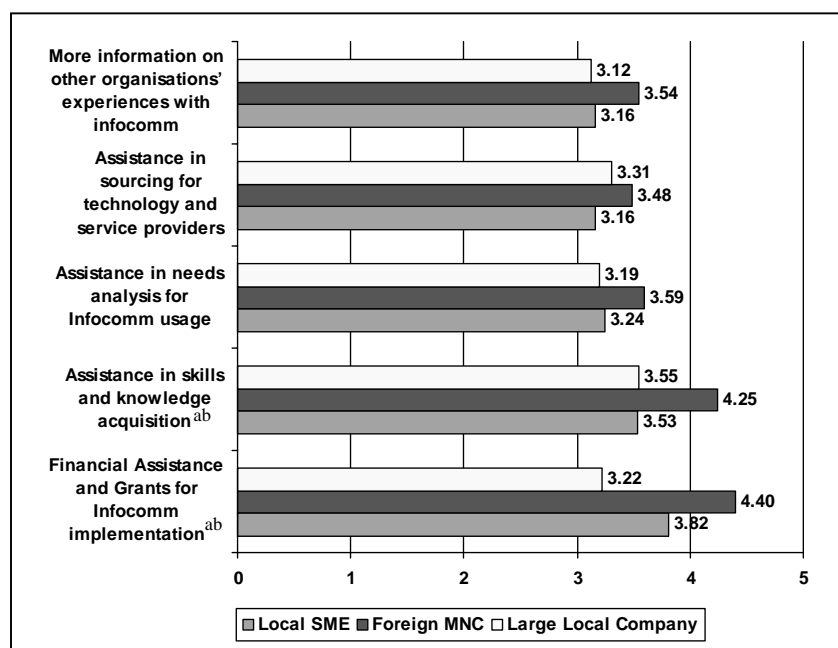
Source: Calculated from Annual Survey of InfoComm Usage in Business 2002.
Note: Mean score calculated on a 5-point scale where 1 = not at all effective and 5 = extremely effective.
 ANOVA: Difference is significant at 1% level.
[b] Welch ANOVA test statistic has been used.

13. Summary and conclusion

As with the private sector as a whole, IT penetration in Singapore's SMEs is fairly high, especially in basic IT such as computer and Internet usage. Thus, further IT development among Singapore SMEs would largely take the form of helping current users to deepen their technological capabilities. They should be encouraged to use network technologies such as extranet and web-enabled EDI to more efficiently integrate and co-ordinate their supply chain activities with business partners. Similarly, those that are already using these established technologies could be encouraged to upgrade to newer technologies such as virtual private networks or smart card technologies. This is especially important given the link between the degree of globalization (defined as the share of exports in total sales) and the sophistication of IT used, suggesting that one way to facilitate SMEs' expansion into overseas markets is to increase the sophistication of their IT usage (NUS, 2003).

Some specific technologies discussed in this report are ASPs, e-commerce, broadband services and wireless technologies. As mentioned above, ASPs are a useful resource for SMEs to keep themselves technologically updated. Since a key barrier to the use of ASPs is lack of knowledge about ASPs, SMEs need to be educated on the capabilities and potential of ASPs and Web Services to help businesses manage their applications and systems integration (NUS, 2003).

Given the positive relationship between the scope of e-commerce activities and the globalization of businesses, SMEs should be actively encouraged to engage in, and further develop, their e-commerce activities (NUS, 2003). There is substantial scope for growth in this area, with less than one third of SMEs currently using e-commerce. Those that do engage in e-commerce have low adoption of best practices and use a limited range of security services. Their rather low level of awareness of online best practices implies that education is a key step in this process.

Education is also needed to raise the awareness of broadband services such as IDC services and rich media creation amongst SMEs. However, education alone is not enough. Given their concerns regarding the reliability, stability and cost of such services, they must have pricing plans and models, which provide reliable services and yet are financially viable.

Very few SMEs use wireless technologies such as GPRS and wireless LAN technologies. In order to increase the adoption of wireless technologies amongst SMEs, their concerns over the compatibility of these technologies with their organizations needs to be addressed. One means by which this can be done is to help those already using these technologies to fully realize their capabilities. They can then be used as models for other SMEs, which will see their relevance to their businesses and be more convinced that the changes needed to implement the technologies are worth their while.

SMEs need not only to extend the range of IT they use, but also to more fully exploit the technologies they already have. Existing IT is commonly used for simple operations, such as using the Internet mainly for information searches, e-mail or exchanging files, rather than incorporating it into production/distribution processes. However, it is not mere technological accumulation that leads to tangible benefits such as increased sales and cost reductions, but rather using that technology (NUS, 2003). It is possible that one reason SMEs are not benefiting more from the IT they have already implemented is because they are not using it to their full capability. Thus it is important for SMEs to be able to make full use of the technologies they already have.

This will require various forms of assistance: education to know which forms of IT would best meet the needs for organization and how to fully exploit them; financial assistance to acquire the technology; and technical assistance to integrate them with their existing systems.

Although SMEs give their employees wide exposure to IT relative to large companies, they spend comparatively little on IT manpower development. Most of their IT budgets are spent on hardware and software. SMEs also need financial and technical assistance to maintain their ICT manpower training and skills upgrading. This is especially critical given that there was a decrease in the proportion of IT budgets spent on Singapore IT manpower between 2000 and 2002, particularly for small organizations (NUS, 2003).

III. SME development in the IT revolution

A. Overview of the relative importance of SMEs in the overall economy

Although the Singapore economy is largely dependent on leveraging on MNCs, local SMEs are also an important part of the Singapore economy. They comprise 92% of total establishments, employ 51% of the workforce and generate 34% of the total value added. However, their productivity is only about half that of the non-SME establishments (SPRING website).

Singapore SMEs have structural weaknesses, which result in poor productivity. These include:

- Weak entrepreneurial culture.
- Insufficient management know-how and professionalism.
- Shortage of professional and technical manpower.
- Insufficient use of technology.
- Outmoded, unproductive methods of operation.
- Limited ability to tap economies of scale.
- Small domestic market.

It is important that SMEs overcome these weaknesses in order to survive, especially since they face competition from more productive large companies, both local enterprises and foreign MNCs, as well as the global market

B. Case studies on e-commerce and supply chain management (SCM) in selected industries[3]

1. RichLand Logistics Services

a)   Company profile

RichLand Logistics Services was founded in February 1992 by Mr Lim Chwee Kim, and has experienced remarkable success over the last decade. Since its inception it has grown from a staff of 10 to over 300, and has 150 vehicles. More significantly, it has generated profits every year of its operation, resulting in profit margins of 9%-10% (The Edge Singapore, 2004). RichLand's turnover was S$32.2 million in 2003, almost double that of 2000 (S$16.1 million), and representing a compound average annual growth rate of 26% over the three years (Annual Report, 2003).

The company has two principal activities: transportation management; and airport cargo terminal handling and supply chain services (Company prospectus). Transportation management services provided by the company include cargo transportation to and from Singapore's airport terminal, seaports, and within Singapore (including micro distribution and project cargo management), along with ancillary services such as packing/repacking goods, and stuffing/unstuffing and crating/uncrating containers. The bulk of RichLand's turnover comes from transportation management services (75.6% in 2003).

Airport cargo terminal handling services include managing Free Trade Zone (FTZ) warehouses[4] on behalf of clients. This entails providing cargo information, inventory reports, labelling and matching of documents to cargo. Supply chain services include warehouse management, inventory management, order fulfilment, distribution logistics centre services and general warehouse storage. One quarter of the company's turnover came from airport cargo terminal handling and supply chain services in 2003 (Company prospectus).

The company's customers include international freight forwarders and MNC manufacturers. Its main client is KWE-Kintetsu World Express (which accounted for 27.3% of the company's turnover for the nine months up to 30 September 2003). Other clients include Seagate Technology International (19.2% of the company's turnover for the nine months up to 30 September 2003), Hewlett-Packard (17.6%) and UPS (8.4%).

RichLand's success has earned it and its founder recognition from Singapore's business community. Mr. Lim won the Rotary – Association of Small and Medium Enterprises (ASME) Entrepreneur Award in 2000, and his company was awarded the Enterprise 50 award in 2003, thus recognizing it as one of the 50 most enterprising privately-held companies in Singapore. In addition, the company was awarded ISO9001:2000 certification in 2002 (Prospectus, The Edge Singapore 2004).

RichLand Logistics recently went public, listing on the Singapore Stock Exchange in 2004. One of its objectives in doing so was to raise funds for its future plans of expanding into overseas markets such as China and India through mergers and acquisitions.

---

[3]   Please refer to annex at the end of the document.
[4]   FTZ warehouses are those in an area within Changi Air Freight Centre where goods are held duty-free until cleared by Customs.

b)   Technologies introduced, purpose of IT usage and its impact

RichLand puts great emphasis on its use of IT. Technology is seen as one of the key elements of its success, enhancing its ability to provide value-added logistics services to its customers (The Edge Singapore 2004, Company prospectus).

In the late 1990s RichLand began to see the importance of computerizing its information flow in order to better serve customers. MNCs and international freight forwarders needed to know what exactly was happening to their deliveries, where their cargo was and when it would be delivered. Prior to computerizing its systems, RichLand's control centre would have to call each driver to find out where they were, and individually bill each company for every job done. They therefore wanted an IT system that would allow them to consolidate all their orders, allow traffic planners to plan their deliveries more efficiently, allow users to know where cargo was at any point in time, and to use the data to bill customers (Lim, 2004).

In order to achieve this, the company hired an IT company to computerize its manual processes in 1999. This attempt was unsuccessful and was later discontinued for two main reasons: there was no change to the company's processes; and there was not much support from the IT company. From this, RichLand learnt that in order to have a successful IT system, it needed its own engineering department to study the company's processes and see what had to be changed, rather than merely automating its existing manual processes (Lim, 2004).

This led to the formation of its engineering and IT departments (now called Supply Chain Engineering and Information Technology departments) in December 2000. An IT service provider was engaged and managed by the IT department. Specifications and company requirements for the system were developed in-house by the IT department, working together with the engineering and operations departments, while the vendor did the programming for them (Lim, 2004). Since the IT and engineering departments were formed, RichLand has spent about $2.3 million in IT and IT-related expenditure, including capital expenditure and manpower costs (The Edge Singapore 2004; Company prospectus).

i)   Transportation Management System

RichLand launched its Transportation Management System (TMS) in July 2001. The TMS, to which RichLand owns the source code, is a web-based system which allows users to take orders, schedule traffic, bill and track cargo. All orders are handled through the central system, and traffic planning is based on this to allocate jobs to trucks, which is communicated to drivers through hand-held electronic devices (handphones or personal digital assistants [PDAs]). Delivery teams also use these devices to update information on the delivery status of their cargo, which is then transmitted to a central database. Customers can use the RichLand website to track their cargo delivery status online, while an EDI B2B e-commerce system allows the delivery status to be transmitted to customers' systems if they so choose. The TMS also helps delivery teams to choose the most efficient or effective delivery route. Initially, the TMS used an SMS platform to transmit information. This was updated to a GPRS system in 2002, allowing information to be transmitted at a faster rate. Controllers no longer need to manually call drivers regarding their cargo; the system is instantly updated with the status of each job. The system has also helped the company to reduce its paperwork and documentation, including billing, as data from TMS is used for billing, so staff do not have to manually key in billing data from hard copies (The Edge Singapore 2004, Company prospectus, Lim 2004).

The two main objectives of the TMS-to satisfy customers' needs for instant information and to improve internal efficiency – have largely been met, although the company has had to fine-tune the system periodically and change its own processes to make sure it works efficiently. The system's limitations, particularly in terms of speed and user-friendliness, provided the motivation

for an enhancement to a more powerful system. Since it was originally implemented, the company's business volume has increased, stretching the system to its limits, and customer requirements are changing. Again, the company is investigating the required scope and has selected an external vendor to do the programming.

ii) Customer Feedback Management System

The Customer Feedback Management System (CFMS) was developed to centralize feedback from customers and allow the company to respond in a timely manner. Introduced in 2001, the system captures comments from customers, who either log them in directly to RichLand's website, or have RichLand employees do it on their behalf. The system also triggers an e-mail to management, so that they know about these issues as they arise. The data are used to generate a monthly report so that the performance of each operation can be evaluated, and a trend analysis of the issues can be conducted. Company industrial engineers regularly analyse the problems and formulate solutions in response (Company prospectus, Lim 2004).

iii) Inbound Management System and Wireless Warehouse Management System

In 2002, RichLand further extended its IT capabilities with its Inbound Management System (IMS) and Wireless Warehouse Management System (WWMS). The IMS was implemented to improve the company's inbound cargo management processes, specifically, the processing of trade and customs declarations. It allows users to capture shipping information electronically and use it for permit declarations. Before the IMS was implemented, staff would receive shipping information by fax and then manually key it into TradeNet (now known as TradeWeb) for permit declaration. The IMS has therefore helped the company to save time and minimize errors by reducing manual data entry.

The WWMS is also a GPRS-based system, used to manage inventory at FTZ warehouses. It processes information scanned from bar codes on the cargo, allowing real time updating of information relating to the movement of goods, and giving the company and its customers much more accurate information concerning their cargo (The Edge Singapore 2004, Company prospectus).

iv) Summary of IT usage and future challenges

From the above account, it can be seen that RichLand has made substantial investments in IT infrastructure and web-based applications, which it has harnessed for a more efficient and effective distribution system. The use of its wireless, web-enabled real-time track and trace system gives greater flexibility and more accurate data regarding cargo movements, so that at any given time, the company and its customers know exactly where their cargo is. It has also reduced response time, minimized data entry errors, and reduced reliance on paper documentation (Company prospectus, The Edge Singapore 2004). This has given the company a distinct advantage over its competitors, especially in the early years of its IT adoption, as most other local logistics companies in Singapore did not have such advanced automated systems and so were not able to monitor their cargo movements as accurately or be in close contact with customers. Nevertheless, many of RichLand's competitors are adopting similar systems, prompting the company to pursue a higher level of technology in order to stay ahead.

As the company embarks on its regional expansion plans, it will face still more IT challenges. Expanding overseas will require an expansion of its current local network to incorporate overseas operations. In addition, the TMS is designed for transportation within Singapore, where distances are short. Once the company expands regionally into larger countries, it will have to incorporate long-haul distribution into its system.

c)   Challenges for SMEs in introducing and utilizing IT

The biggest challenge RichLand faced with regard to adopting its IT systems was staff acceptance and adaptation. Having become used to manual processes, employees were reluctant to move to a computerized system. This was aggravated by the fact that one main group of users of the TMS system is comprised of drivers, who tend to have relatively low levels of education and computer literacy. Teaching staff how to use the hand-held electronic devices and update the system, and convincing them of the need to do so, required a process of training and communication over several months (about nine months to one year). Similarly, the biggest challenge with regards to the CFMS is ensuring that employees do indeed update feedback into the system.

Over time, usage of the IT system became the norm in the company. Nevertheless, regular dialogue sessions are conducted with staff, allowing a two-way exchange where employees can gain a better understanding of the company's requirements and are encouraged to see the benefits of using IT to increase their productivity, while management can listen to employees' concerns (Lim 2004).

RichLand's adoption and exploitation of IT is also constrained by the nature of its industry and by the IT sophistication of its customers. Initially, the company wanted to use the TMS to optimize job planning, but found that staff preferred to do planning manually, especially given the many last-minute changes inherent in the transportation industry. Furthermore, if customers do not want to computerize their own systems, RichLand cannot fully exploit its own IT. For example, although the TMS can transmit cargo information to clients' systems via EDI whenever the RichLand system is updated, few customers make use of this service. Similarly, in the case of the CFMS, RichLand staff logs in most of the feedback on behalf of customers because many of their customers do not have Internet access at operational level.

d)   Lessons learned from the case

The RichLand case offers some insights and lessons that can be learned for IT usage in SMEs:

i)   The company must see the need for IT, recognizing its relevance to the industry, and its ability to give the company an edge over its competitors. It is noteworthy that the IT usage survey shows that many companies not using IT do not see the need for it. By contrast, RichLand took steps to adopt an IT system as a way of giving better service to customers and differentiating themselves from competitors, and so became the first local logistics company to have such a system.

ii)   Implementing a successful IT system requires perseverance, as companies will not always immediately know what technology is most appropriate for them, or how best to implement it. RichLand's first attempt to computerize its processes failed. The fact that it has a successful system today is at least partially because it did not give up after its first attempt, but learned from its mistakes along the way.

iii) The success of IT use in a company depends not only on the physical infrastructure, but also on the people. Adequate attention must be paid to training staff and addressing their concerns in using IT. Part of RichLand's success in its IT usage is due to the fact that it did not focus purely on its IT infrastructure, but took pains to develop a culture where staff are adaptable to change and able to use IT effectively (Company prospectus).

iv) SMEs face external constraints that limit or discourage their IT usage. These can be due to the nature of the industry, or the IT sophistication of their suppliers and/or buyers. One example of this is the labour-intensive transportation management industry, where most small companies do not have the critical mass to be able to implement sophisticated IT systems. Furthermore, if suppliers and buyers do not have a high level of IT usage, there is little incentive for SMEs to adopt their own systems. RichLand was able to do so because it had a critical mass in terms of major MNC accounts, giving it sufficient business from customers with a relatively high level of technological sophistication to make investing in IT worthwhile.

2. Uniseal Waterproofing

a) Company profile

Uniseal Waterproofing was incorporated in 1998 and has since become one of the leading waterproofing companies in Singapore. Although initially serving mainly residential properties, the number of Uniseal's commercial clients subsequently increased and extended to factory owners, consultants, property management firms, clubs, embassies, and hotels. Currently, providing roofing and waterproofing solutions to residential and commercial properties remains its core business, but the company also provides services for new buildings. Uniseal also has an active R&D division, and through its efforts has pioneered waterproofing treatment for tiled roofs (Computerworld 2003; Company website; Choo, 2004).

Although it is a small company, with a staff count of about 30 people in Singapore, Uniseal has successfully expanded overseas. It established operations in Malaysia in 2002, and then in India and the Philippines in 2004. Its expansion is continuing, with the company looking into establishing operations in Thailand.

Uniseal has also won a number of awards. It was the first waterproofing company in Singapore to obtain ISO 9001:2000 certification (in 2002) and the Singapore Quality Class Award (SQC) (in 2003). The company is currently pursuing the Singapore Promising Brand Award[5] and the People Developer[6] standard (company website; Choo, 2004).

b) Technologies introduced, purpose of IT usage and its impact

One of Uniseal's key business strategies is providing good customer service, through which it gains subsequent referrals. Clients are monitored closely, being contacted within one to three months, and again after one year of job completion, in order to provide after-sales care. As such, Uniseal's IT systems are aimed at enhancing customer service as well as streamlining operations.

i) Wireless Sales Force Automation System

The Wireless Sales Force Automation System was implemented in order to improve customer service, reduce response time, track stock, and improve overall company productivity and profitability. It gives staff instant access to information regarding customers (including customer preferences) and available warehouse stock. Salespeople onsite use PDAs to access job details such as the warranty period, items under warranty and warranty coverage.

---

[5] This is an annual award established to recognize local SMEs that have shown outstanding performance in the communication of their Brands (http://www.spba.com.sg/about.htm).

[6] This is Singapore's national standard for human resource development (http://www.spring.gov.sg/ portal/newsroom/epublications/pd/2002_01/index5.html).

In this way, they can determine without delay whether changes in orders are chargeable or whether projects are still under warranty. They can also create maintenance service orders and sales orders and submit them wirelessly to the office. The system also allows the staff to monitor the availability of stock at any point in time. This again reduces delays in responding to clients, as customers can be informed immediately upon job confirmation when their project can start and can receive their orders within hours. Uniseal's wireless system has also helped it to improve its closing rates, attract customers and reduce delays in billing and quotations (Choo, 2004; Computerworld, 2003).

ii) Wireless Project Tracking System

Uniseal's Wireless Project Tracking system was implemented to improve the company's project management, specifically, to facilitate monitoring project schedules, manpower allocation and costing. The system allows project managers and supervisors to use PDAs to retrieve real-time project information and submit updates on project progress and resource usage. Upon completion of a job, the system is used to calculate project profitability and to track customers for after-sales care. The Wireless Project Tracking System gives the company more accurate information that can be used for analysis and decision-making, giving greater insights into company revenue and costing. It has also improved payment tracking and reduced administration and processing costs. Turnaround time for sales services has also been reduced, as customer enquiries regarding project status can be answered immediately, rather than having to wait until records are manually checked or site staff can be contacted (Computerworld, 2003; Choo, 2004).

iii) Customer Relationship Management (CRM) module

Uniseal implemented a CRM system in 2004. The system, which is not wireless, tracks information on customers and potential customers regarding enquiries, problems faced and service provided. Data from the CRM is analysed to identify weaknesses and recurrent problems, and to determine their causes. These in turn are used to plan marketing strategies.

iv) Summary of IT usage and future challenges

Uniseal's desire to be a leading waterproofing company has prompted it to undertake substantial investment in IT compared to other companies in the Singapore construction industry. Its wireless IT system has given it greater access to data and project information, allowing managers to make more informed decisions, and improving analysis of pricing changes and promotions. Perhaps one of its key benefits has been improving product availability by enabling faster analysis and recognition of changes in demand (Computerworld 2003).

As with RichLand Logistics, the biggest challenge Uniseal faced in implementing its IT systems was acceptance by staff. Company employees initially preferred using the old system and were reluctant to take the time to learn how to use the new system and become comfortable with it. The process of adapting to the new system took about four months.

Unlike RichLand, however, Uniseal is heavily dependent on its IT consultant. Lacking its own IT department and IT-trained staff, Uniseal would not on its own know what technologies are available or how they can help its business. Its IT consultant proposed all the systems used by company, designed the templates, installed the systems and conducted training, as well as performing system troubleshooting and answering queries from Uniseal users. This heavy dependence has worked well in Uniseal's case because its consultant (introduced by a personal contact) has a good understanding of its business and the technologies that would be most relevant for it. At the same time, the company maintains the final decision over what is implemented, as the consultant may be keen to install system upgrades or new systems that the company is not ready for, not having fully adjusted to the systems it already has.

Future IT plans for Uniseal involve upgrading its current system with new features. These include finding a way to compress image files so that photos can also be submitted from job sites using PDAs, further reducing delays in producing quotations, and-subject to budgetary constraints – converting the current CRM system to a wireless module.

c)   Lessons learned from the case

The Uniseal case offers some insights and lessons that can be learned for IT usage in SMEs:

i)   The relationship between SMEs and their IT consultants is important, because external consultants can play a key role in SMEs' IT adoption. SMEs often lack knowledge of the forms of IT available to them and how they can be harnessed for their businesses. It is thus important that the consultant should have a good understanding of the company's industry, business and culture, including staff familiarity with IT. Only then can the consultant give the SME sound advice, design the most appropriate solution, and help the company to implement and adapt to it. For example, the wireless system that Uniseal's consultant recommended was clearly appropriate for the company given that its operations are dispersed in different locations (main office, job sites and warehouse). Moreover, since the company lacks expertise in using the system, the ongoing service from the consultant (troubleshooting the system and answering queries) was much needed for Uniseal to successfully adopt the system.

ii)   At the same time, SMEs cannot cede control over the IT implemented to their consultant, as consultants may advise them to implement systems that they are not ready for, or that are not necessary. SMEs themselves are in the best position to decide how effective their IT systems are in improving company productivity and profitability, and how much of their resources are available to adapt to another system. Thus Uniseal has not implemented upgrades recently recommended by its consultant because it finds its current system sufficient for its current needs and, with all its other activities (ongoing business operations and pursuing awards/standards), it does not have the resources to invest in, and learn how to use, a new system (Choo, 2004).

IV. Government policies designed for SMEs, IT, and international trade

A. Policies to support SMEs

1. Overall policy direction for SMEs and entrepreneurship in Singapore

The government's policy drives to promote SMEs and entrepreneurship in Singapore can be basically divided into three target groups. The first covers SMEs directly; the second targets local enterprises with high growth potential ("Promising Local Enterprises") and a chance to be nurtured into globally competitive multinational enterprises in the future; and the third is aimed at high-tech start-ups in knowledge-based, emerging sectors which carry a high risk but hold promise for significant growth through innovation and intellectual property.

a)   SME 21: Promoting SMEs   (www.spring.gov.sg; Wong *et al.* 2004)

The main policy plan for the support of SMEs is outlined in the SME 21 master plan, a ten-year strategic plan that was launched in January 2000. The aim of SME 21 is to build up the capabilities of SMEs in order to enhance their contribution to Singapore's competitiveness and economic growth.

The plan outlines three major targets to achieve by the year 2010:

i)   To double productivity gains in the retail sector from S$28,000 to S$56,000. The aim here is to enhance the productivity of SMEs in domestic service sectors by restructuring, revitalizing and upgrading the sectors. Besides higher productivity, the utilization of resources, particularly land and labour, will also be improved. The retail sector has been selected as one of the major domestic service sectors to be focused on. At $56,000, the retail sector's productivity will be 70% of the current national productivity level.

ii)   To triple the number of local SMEs with sales turnover of S$10 million and above from 2,000 to 6,000. The aim behind this goal is to develop a range of innovative, high-growth SMEs that can compete on the global market on a sustainable basis.

These SMEs would produce innovative goods and services, use information and technology to add value to new products and services, develop and use brands to increase the knowledge component of their products, and have superior distribution channels. The result will be higher sales for the SMEs. Achieving this target means that one in every 15 local SMEs will have the potential to become a large company.

iii) To quadruple the number of local SMEs with e-commerce transactions from 8,000 to 32,000. The aim is to create a knowledge-based, pro-enterprise environment, in other words to create an environment where the appropriate mindset for business is inculcated, entrepreneurship and innovation are encouraged, and barriers to organizational growth are eliminated. As a result, the creative capacity of SMEs will be improved. E-commerce has been selected as a target because it is a key enabling factor, opening up opportunities and removing traditional barriers to SME growth. Achieving this means that one third of local SMEs will have overcome the limitation of the small domestic market by competing in the global market.

In order to accomplish this, the government has formulated a three-pronged approach comprising promotional strategies at the enterprise-level (e.g. improving business management and strategic planning capabilities), sector-level (e.g. sector specific productivity upgrading programmes), and other broad-based programmes (e.g. programmes to promote branding and franchising, e-commerce adoption, lifelong learning and skills upgrading programmes, etc.). The Standards, Productivity and Innovation Board (SPRING) —formerly the Productivity and Standards Board (PSB)— has been designated as the lead agency to implement the SME 21 Plan.

b)   The Promising Local Enterprises (PLE) Programme: Promoting High Growth Firms   (www.sedb.com, Wong *et al.* 2004)

Introduced in 1995, the Promising Local Enterprises (PLE) programme aims to nurture strong local enterprises to become Asian MNCs. The Economic Development Board (EDB) is the lead agency to implement this initiative. PLEs are identified as those with strong core capabilities, growth-orientated management and the capacity and critical mass to grow. Under the PLE programme, EDB works with PLEs to develop new capabilities, identify and facilitate strategic alliances and provide growth capital to groom them into world-class enterprises. The programme has set the target of producing 100 PLEs with at least S$100 million sales turnover by 2005. EDB will continue to work with these companies to facilitate their growth into Asian MNCs, defined as those with an annual turnover of S$400-S$500 million and a significant presence in at least four markets overseas.

In 1999, a 3C approach (comprising co-investment, collaboration and consolidation) was announced by EDB to further intensify the PLE programme. Under co-investment, EDB will take short-term equity stakes of up to 30% in PLEs to support their growth. After an appropriate period, EDB will exit from these investments, for example by selling its shares back to the PLEs. Under collaboration, EDB will encourage greater collaboration among industry players and "matchmake" strategic partnerships, where appropriate, between PLEs and foreign MNCs. Under consolidation, EDB will facilitate the merger of industry players so that they emerge stronger and more competitive.

c)   The Technopreneurship 21 (T21) Initiative: Promoting High-Tech Entrepreneurship   (www.sedb.com and press reports; Wong *et al*. 2004)

Announced by the Government in April 1999, Technopreneurship 21 (T21) is an initiative involving high-level government and private-sector efforts to prepare and lay the foundation for the successful development of a high-tech entrepreneurship sector in Singapore.

The T21 initiative is guided by a high-level T21 Ministerial Committee, which looks at setting economic strategies to foster the development of technology enterprises and reviews their implementation. The committee also oversees the implementation of key initiatives by relevant government agencies and works with the private sector to encourage local and foreign talents to start up and grow technology-intensive activities in Singapore.

Supporting the Ministerial Committee are two working committees: an Executive Committee and a Private Sector Committee. The Executive Committee, which has multi-ministry representations, identifies key areas in which the government can facilitate the development of the technology sector and help implement private sector proposals. The Private Sector Committee, which solicits views from both local and foreign individuals from a wide spectrum of backgrounds, provides feedback to the government, suggests initiatives, and recommends proposals to encourage Singaporeans to be more entrepreneurial, as well as to attract foreign entrepreneurial talents to settle in Singapore. In addition, an International Resource Panel, comprising well-known venture capitalists and successful businessmen from high-technology zones around the world serves as a sounding board for ideas and offers insights into technopreneurship development.

T21 covers four areas critical for the development of technopreneurship: education, financing, regulations and facilities.

Under T21, the government aims to revamp the educational system in schools and develop the public universities into world-class institutions. Changes have been made to the curriculum and teaching approach to allow for more flexibility and variety, and students are given more opportunities for exposure to business and entrepreneurship.

At the same time, a US$1 billion Technopreneurship Investment Fund (TIF) was launched to attract more venture capital (VC) activities to Singapore. TIF is intended as a fund of funds to jump-start the development of the venture capital industry in Singapore. The aim is not merely to attract funds to be based in Singapore, but also to draw in a range of players who are knowledgeable about the venture capital business, are able to assess and value intellectual property, can understand and manage the risks, and have the network to help businesses to grow in the global market. The purpose of establishing the TIF is not to have the Government duplicate or compete with private venture capital funds but to attract into the industry people who are able to assess the commercial viability of technology ideas and help start-up companies to grow. The government therefore intends to work with, and through private sector venture capital firms, to stimulate the venture capital industry in Singapore. As of July 2004, about S$16 billion in VC funds were managed out of Singapore by more than 150 VC firms.

TIF is managed by TIF Ventures, a corporatized subsidiary of EDB, and GIC (Government of Singapore Investment Corporation). A subset of the TIF is a $10 million fund, called Venture Investment Support for Start-ups (VISS), which provides equity funding to hi-tech start-ups on a co-investment basis with sophisticated investors (http://www.tifventures.com; Wong *et al.,* 2004).

There are also plans to create comfortable and conducive facilities that provide an intellectually stimulating and creative environment for technopreneurs. One step in this direction is the planned development of a Science Hub with world-class facilities, which are attractive to international talent working in knowledge industries, especially in high technology. Another hub in development, One North, aims to be a hub for entrepreneurs, innovators, researchers and venture capitalists to live, work and interact.

Initially the National Science & Technology Board (NSTB) was the lead agency appointed to spearhead the implementation of T21. From January 2001, however, the policy

implementation system was refined, and the Economic Development Board (EDB) took over from NSTB the role of the lead government agency providing focus and direction to the technopreneurship drive.

Under NSTB, several major policy changes were introduced, including changes to bankruptcy laws and taxation on employee share options and the introduction of a new Technopreneur Investment Incentive scheme. Other changes to existing rules and regulations include allowing technopreneurs to use residential properties to register their businesses and allowing foreign technopreneurs to explore business opportunities in Singapore through the issuing of Work Passes and Long Term Visitors Passes. In parallel with such changes, the government also introduced a significant liberalization of the listing requirements of the Singapore Stock Exchange, making it easier for new start-ups with little profitability track records to be listed.

The government has also institutionalized the review of rules and regulations with the formation of the Pro-Enterprise Panel (PEP) in August 2000. PEP conducts activities such as evaluating suggestions from business and conducts an annual survey of regulatory agencies' pro-enterprise orientation. As of July 2004 PEP had received more than 1,200 suggestions from business, of which about half were accepted.

The T21 initiative provides a number of initiatives and measures to stimulate and support entrepreneurship. These include the Technopreneur Investment Incentive (TII), now expanded and renamed the Entrepreneur Investment Incentive (EII), the Directors and Advisors for Technopreneurial Enterprises (DATE) programme and the Startup EnterprisE Development Scheme (SEEDS) (see below for more details).

d)   Economic Review Committee: Entrepreneurship and Internationalization Sub-Committee   (MTI website: www.mti.gov.sg and press reports)

The Economic Review Committee (ERC), set up in December 2001 to devise the future direction of Singapore, built on and expanded the plans for entrepreneurship outlined in T21. The Entrepreneurship and Internationalization Sub-Committee (EISC) was established as part of the ERC to recommend ways to strengthen entrepreneurship and innovation in Singapore, and to foster the growth and internationalization of Singapore-based companies.

The EISC formulated a framework of six elements to accomplish this:

(i)   Culture

Creating opportunities for young people to develop entrepreneurial instincts and understanding through measures such as including entrepreneurship education as an enrichment activity in schools, incorporating business projects into curricula and adopting policies in universities that encourage commercialization of intellectual property.

(ii)   Capabilities

Enterprise capabilities need to be developed at both individual and industry levels. At the individual level, greater flexibility will allow freer movement of talent between the public and private sector. In particular, measures were suggested to mitigate the absorption of top talents into the public sector due to bonded government scholarships, and to attract global entrepreneurial talent to Singapore. At the industry level, greater collaboration will allow enterprises to leverage each other's strengths to venture abroad. Specific recommendations include development of industry clusters when venturing overseas and expansion of the current Local Industry Upgrading Programme administered by the Standards, Productivity and Innovation Board (SPRING) to promote globalization.

(iii)   Conditions

This element addresses the regulatory landscape as well as the government's role in business. Government should take an enterprise-friendly approach to regulation and economic management. Specific recommendations include a review of licenses and imposing a sunset rule on licenses. Principles and approaches for the government's involvement in the private sector were also outlined, including management of government-linked companies, procurement and outsourcing and the corporatization of public sector functions.

(iv)   Connections

While Singapore has done well in terms of developing the hard structure for global connectivity, such as its transportation capabilities, much can be improved in terms of soft infrastructure. Specific recommendations include the positioning of International Enterprises Singapore (IE Singapore) as a champion of internationalization, focusing IE Singapore's effort on selective industry cluster and pioneer enterprises, pushing Free Trade Agreements and establishing a network of Double Taxation Agreements with trade partners.

(v)   Capital

The EISC identified gaps in enterprise financing, specifically in equity financing for start-up enterprises and debt financing for emerging enterprises. These gaps were attributed to the financial institutions' reliance on asset-based financing and lack of knowledge of various industries. The EISC recommended mechanisms such as a private equity exchange, allowing for losses from investments in qualified start-ups to be tax-deductible and waiver of taxes on profits arising from financing using intellectual property as collateral. It also suggested broad-based measures to free up capital tied in compulsory retirement schemes and in residential properties.

(vi)   Catalyst

The EISC also recommended a package of incentives and changes to tax regulations to channel more capital towards enterprise, e.g. by creating incentives for private equity funds that help Singapore-based companies, waiving tax for qualifying start-ups for five years, waiving estate duties and expanding the list of expenditure items eligible for double tax deduction.

2. Organizations involved in supporting SMEs and entrepreneurship in Singapore

a)   Establishment of Action Community for Entrepreneurship   (www.ace.org.sg)

The Action Community for Entrepreneurship (ACE) was launched in May 2003 as a public-private sector collaborative effort, and has been working with the government to implement the T21 initiatives. As a pro-enterprise movement that aims to create a more business-friendly environment in Singapore, ACE provides opportunities for networking between entrepreneurs, angels, venture capitalists, bankers, lawyers and other professionals. It also engages in educational efforts to increase awareness of entrepreneurship and to encourage more entrepreneurial thinking among Singaporeans.

ACE's purpose is fourfold: to serve as a peer support group for entrepreneurs, by entrepreneurs; to drive implementation of initiatives, programmes and projects to nurture entrepreneurship; to interface between the private sector and government; and to raise the profile of entrepreneurs and reach out to the public. It does this through seven Action Crucibles or action teams, which will focus and develop specific entrepreneurship programmes. These Action Crucibles are:

(i)   Rules

Identifying areas where rules should be changed or simplified, including reviewing business licenses and application procedures.

(ii)   Financing

Improving businesses' access to funding.

(iii)   Culture

Fostering a more entrepreneurial culture in Singapore.

(iv)   Global Entrepreneurial Executives

Attracting global entrepreneurial talent, including Singaporeans living abroad, to start and grow their enterprises in Singapore.

(v)   Intellectual Property

Helping entrepreneurs in the areas of intellectual property protection and commercialization.

(vi)   Internationalization

Fostering the internationalization of local enterprises.

(vii)   Branding and ACE website

Branding of ACE and the entrepreneurship movement.

b)   SPRING Singapore   (http://www.spring.com)

Formerly Singapore Productivity & Standards Board (PSB), SPRING's mission is to enhance the competitiveness of enterprises for a vibrant Singapore economy, and it is the main government agency responsible for implementing the SME21 initiative. As such, it provides assistance to SMEs on product and process development, testing and evaluation. Its assistance schemes for local enterprises include:

(i)   Local Enterprise Finance Scheme (LEFS)

A financing programme designed to encourage and assist local enterprises to upgrade, strengthen and expand their operations.

(ii)   Micro Loan Programme

A fixed interest-rate financing programme designed to help very small local enterprises to gain better access to financing.

(iii)   Local Enterprise Technical Assistance Scheme (LETAS)

A scheme to help local enterprises defray costs incurred in modernizing and upgrading their operations by engaging an external expert for a limited period of time (see chapter IV. B. for more details).

(iv)   Loan Insurance Scheme (LIS)

A scheme to complement LEFS, the LIS is offered through six Participating Financial Institutions (PFIs). It provides an additional form of financing for SMEs. The scheme allows more flexibility for financial institutions to package attractive loan facilities to SMEs, based on their risk profile.

(v)   *Entrepreneur Investment Incentive (EII)*

Gives tax credits to investors for their investment loss in qualified non-technology start-ups (see below for more details).

c)   InfoCommunications Development Authority (IDA)   (www.ida.gov.sg)

The IDA is Singapore's lead government agency driving the InfoComm 21 Initiative. Besides regulating the local telecommunications and e-commerce practices, it also administers various schemes to promote computerization and Internet applications in local enterprises, such as:

(i)   *Local Enterprise Computerization Programme (LECP)*

Provides assistance to local SMEs in hiring IT consultants for their IT projects.

(ii)   *Local Enterprise Electronic Commerce Programme (LECP-EC)*

Extended the LECP to e-commerce by subsidizing the cost of acquiring e-commerce applications and services for SMEs.

(iii)   *E-Business Industry Development Scheme (EBIDS)*

Expanded the LECP-EC programme by including the use of applications through Applications Service Providers. eBIDS Plan 1 supports up to half of the cost of qualified e-commerce related consultancy, subscription fee for up to 12 months, hardware and software purchases. eBIDS Plan 2, which focuses on helping businesses that already have e-commerce to expand their capabilities, funds companies proportionately based on the total e-commerce value they create.

d)   International Enterprise (IE) Singapore   (http://www.iesingapore.gov.sg)

Recognition that in order to maintain its competitiveness Singapore had to expand beyond its investment-driven, electronics-dominated export base, led to the restructuring of the Singapore Trade and Development Board (TDB) to become International Enterprise Singapore (IE Singapore) in 2002. IE Singapore's mission is to help Singapore-based companies that are willing and able to grow and internationalize successfully. It also promotes Singapore as an SME hub by attracting enterprises from other countries, so that they can collaborate with International Singapore Companies to venture into the region.

IE Singapore focuses on four areas in helping local companies to grow and internationalize:

i)   Understanding Customers' Needs

In order to help Singapore firms venture overseas, they have taken steps to improve their understanding of the needs of Singapore firms and the challenges they face when going abroad. This includes organizing its divisions into industry verticals, so that staff can develop a good knowledge of the industries, which firms are operating in, and developing an account management system, so that customized internationalization plans can be developed for firms.

ii)   Market Connections

IE Singapore has more than 35 overseas offices, providing companies with market insights and entry facilitation. In addition to overseas centres, IE Singapore has set up Business Support Offices in China, Mexico and the US, to provide temporary office space and consultancy services to Singapore-based companies (IE Singapore 2003). To help Singapore-based companies share knowledge and facilitate networking, it has also formed networking platforms, such as Network China, Network India and Network Indonesia, which provide online portals,

e-newsletters, seminars, missions and other events. Other activities include conducting trade fairs and pursuing FTAs.

iii) Firm-Level Competency

In order to develop firm-level capabilities needed for entering overseas markets, IE Singapore has launched initiatives in branding and manpower. Its Branding for Internationalization programme has five key initiatives: Brand Recognition (leading brands are recognized and profiled); Brand Research (companies receive support for applied research to enhance their brand strategies); Brand Training (companies receive support to develop core branding skills); Brand Incentive (companies receive co-funding for strategic brand development); and Brand Network (companies receive enhanced access to brand resources and experts). IE Singapore also launched the Singapore Brand Award, establishing a benchmark against which Singapore brands could be compared to the world's leading brands.

Two programmes for talent development include the Overseas Manpower Programme, which sends executives to overseas markets to undertake project work, and the Strategic Manpower Conversion Programme for Internationalization (conducted with the Ministry of Manpower) to enable globalizing companies to equip executives with international marketing and business development skills.

iv) Accessing Capital

To help Singapore-based companies secure the necessary capital to finance their overseas ventures, IE Singapore implemented several initiatives to increase companies' knowledge of financing tools and ease their access to funding. These include:

- iFinance Consulting Programme: Supports internationalizing companies in engaging the services of professional financial experts for their overseas expansion projects. The Programme supports companies in private fund-raising, mergers and acquisition of foreign entities and other financial-related activities.

- Regionalization Finance Scheme: A government loan scheme with a fixed interest rate, aimed at helping companies finance overseas assets acquisition.

In addition to these programmes, IE Singapore also organizes workshops and seminars to inform companies of the various financing options available, to equip them with the right financial management skills for globalization, and to help them gain insights into financing issues in foreign markets. It also maintains close contact with a network of financial institutions and investment communities. For example, the Financial Advisory Group was launched in 2002, comprising experienced bankers from 10 foreign and local financial institutions. This creates a platform for the government to obtain feedback from financial institutions on its finance-related initiatives and programmes, and to keep abreast of the industry's products and services pertaining to the internationalization of businesses.

Various forms of ICT are used to provide information that Singapore-based enterprises need in their internationalization efforts. The Venture Abroad HelpLine provides updated and practical information necessary for overseas ventures, answering queries on subjects such as business contacts, regulations, incentives, statistics and country information, while the Go China HelpLine was launched to provide more in-depth information on the China market. The International Business Opportunities (IBO) website provides online business matching. The website provided 26,000 foreign contacts for its more than 1,500 local subscriber companies, and achieved 1,800 successful matches in the year 2002/3. IE Singapore has also worked with the National Library Board to feature its information products, including reports on China's industries, statistics on Singapore's international trade, and a listing of top traders, on Singapore's

digital library portal eLibraryHub. Other online tools are available on IE Singapore's website, including 400 frequently asked questions, based on actual enquiries, and their answers. More than 6,000 hits have been registered since its launch in April 2002.

IE Singapore also has an iReadiness Toolkit that helps companies to identify their strengths and developmental opportunities, as well as to assess their own readiness to internationalize. Over 230 companies have taken the assessment since its launch in June 2002.

3. Specific programmes supporting entrepreneurship in Singapore

a)   Entrepreneur Investment Incentive (EII)
(Wong *et al*. 2004; http://www.sedb.com/edbcorp/sg/en_uk/index/startups/financing/enterprise_ investment.html; http://www.spring.gov.sg/portal/products/assist/edf/EII.html)

The Entrepreneur Investment Incentive scheme provides investors in innovative and high growth start-ups with loss insurance to facilitate capital funding for entrepreneurs in the initial phase of growth. Originally established as the Technopreneur Investment Incentive (TII) in 1999, the scheme was renamed as the EII since the scheme has been expanded beyond the technological sectors. The scheme is jointly administered by EDB, which is responsible for technology start-ups, and SPRING Singapore, which oversees non-technology start-ups. Qualified technopreneur start-ups will be given EII (Technopreneur) Status by EDB, while non-technology start-ups will be granted EII Status by SPRING. The start-up can then issue certificates to its investors up to a maximum investment of S$3 million. Investors with valid certificates are entitled to deduct their loss amount against their taxable income. Applications from overseas start-ups are evaluated on a case-by-case basis provided that there is significant link for Singapore to receive economic spin-offs arising from the operation.

A start-up company can be granted the approved EII status for a maximum of five years. During this period, it must continue to satisfy the qualifying conditions. There is no possibility of renewal or extension of the status for the same company. If the company wishes to embark on a new qualifying entrepreneurial activity, it would need to set up a new entity.

b)   Business Angel Fund (BAF) Co-Investment Scheme and Venture Investment Support for Start-ups (VISS)
(https://venus.edb.gov.sg/deals/start_ups_companies.html;   http://www.tifventures.com/direct-viss.phtml and Wong et al 2004)

The BAF's co-investment scheme was initiated as a scheme under the former NSTB. It was designed to encourage Business Angel investments as a means to stimulate technopreneurship activities in Singapore. The fund helped business angels to diversify their portfolio by leveraging the Government's fund, while enjoying high returns through investing in this high-growth industry. After the restructuring of NSTB into A*STAR (Agency for Science, Technology and Research), the BAF scheme was overseen by the Economic Development Board and managed by TIF Ventures.

Following cessation of the BAF, the Venture Investment Support for Start-ups (VISS) programme was introduced. VISS is a S$50m co-investment programme that directly co-invests into early-stage, promising and strategic companies that are based in, or linked to, Singapore. It is managed by TIF Ventures Pte Ltd, which will invest in a company with a minimum leverage factor of $1 VISS investment for $2 of private investment. The investment amount will not be more than S$500K and TIF Ventures will not become the largest single shareholder in the company. To-date, the VISS fund has been invested in over 25 local and foreign technology start-ups.

c) **Directors and Advisors for Technopreneurial Enterprises (DATE)**
(http://www.sedb.com/edbcorp/sg/en_uk/index/startups/technopreneurship/directors_and_advisors.html)

Start-ups and emerging enterprises (SUEs), if left alone, may find it difficult to attract experienced and credible Directors onto their Board. The Directors and Advisors for Technopreneurial Enterprises (DATE) Programme facilitates mutual partnerships by bringing together technopreneurial SUEs with seasoned business people (Advisors) who have the skills, contacts or insights to develop the SUE further. Advisors can serve on the Board of Directors of these SUEs, and become actively involved in their management and operation. This allows the top management of SUEs to acquire useful business management tips through the personal experiences shared by their Advisors, so that they will be better prepared to direct their companies.

DATE is administered and managed by EDB. EDB recommends potential matches to SUEs and Advisors, based on their industrial knowledge and expertise in business functions and geographical locations. Matched parties first come together to define clear goals for themselves at the beginning of the Programme. There is no pre-determined duration for the Programme or any stipulated matching. Mentees and Mentors decide for themselves the eventual form of their partnership and whether the Mentor remains as Advisor or serves as a Director to the company.

d) **Startup EnterprisE Development Scheme (SEEDS) and SPRING SEEDS**
(http://www.sedb.com/edbcorp/sg/en_uk/index/startups/financing/startup_enterprise.html; Wong *et al.* 2004; Khin, 2004a)

The Startup Enterprise Development Scheme (SEEDS) is a S$50 million fund administered by the EDB and launched in 2001 with the objective of fostering entrepreneurship and innovation activities in Singapore through matching financing by the Government. The scheme provides equity financing for start-ups in the seed stage of enterprise formation. Every private dollar raised from third-party investor(s) by the company will be matched by EDB, up to a maximum sum of S$300,000. The minimum investment by third party investors is S$75,000, and both EDB and third-party investors take equity stakes in the company in proportion to their investments.

In 2004 the SEEDS programme was extended to SPRING SEEDS. Another S$10 million, administered by SPRING, was set aside to fund non-technology start-ups (Khin, 2004b)

e) **Patent Application Fund Plus (PAF PLUS)** (www.ipos.gov.sg; http://www.sedb.com/)

Administered by EDB, PAF PLUS is a financial assistance scheme to help applicants defray the cost of patent applications. It is specifically targeted at individuals and SMEs, and is designed to promote greater innovation and awareness of patenting amongst inventors, start-ups and SMEs, encouraging inventors to patent their inventions, and encouraging greater commercialization activities to extract value from patents

B. Special measures to correct the 'digital divide' among companies

1. Local Enterprise Technical Assistance Scheme (LETAS)
(http://www.spring.gov.sg/portal/products/assist/edf/letas.html;
http://www.spring.gov.sg/portal/products/assist/edf/repositioning_LETAS.html)

The main scheme that has been specifically designed to assist local SMEs upgrade their IT is the Local Enterprise Technical Assistance Scheme (LETAS). Launched in 1982, LETAS initially

helped local enterprises defray the cost incurred in modernizing and upgrading their operations through the engagement of an external expert for a limited period of time.

The assistance provided was generally up to 50% of the cost of engaging an external expert. Areas of assistance that may be supported are:

- Identification and solving of technical problems.
- Technical improvements to present operations or processes.
- Mechanization, automation or computerization of operations or processes.
- Quality management systems.
- Business development.
- Financial development.
- Market development.
- Computerization and management information.
- Human resource management.
- Product development.
- Franchise feasibility study and development.

SMEs could apply for assistance under LETAS to defray the cost of engaging IT consultants for IT implementation and e-commerce projects. IT implementation consultancy includes: initial fact finding, defining and documenting users' requirements, initial project schedule planning, project monitoring and control, procedure streamlining and formalization, assistance in data conversion, planning and conducting user acceptance tests, parallel run assistance and planning for post-implementation review. E-commerce consultancy includes: initial project requirement investigations, project specification & design, project development and implementation, user acceptance test, post-implementation and review.

LETAS is generally considered a successful programme. Since the launch of the scheme in 1982, more than 15,000 local enterprises have received funding, with grants of about S$500 million being disbursed. This generated $190 million of benefits amongst the recipient SMEs in the last financial year in terms of increased sales turnover and lower operational costs, or about $5 of benefits for every LETAS grant dollar. IT projects and quality management systems accounted for more than 70% of all the LETAS projects approved.

In 2004, however, LETAS was repositioned to take account of the different needs of different SMEs. Thus, there are now three tiers of assistance provided under LETAS to SMEs, varying in line with their maturity and needs:

a) Broad-based Assistance

Not all SMEs require fully-fledged consultancy services. Some SMEs, especially start-ups and smaller enterprises, only need professional advice to help them deal with fundamental issues such as financial management and business planning. For this group of SMEs, SPRING Singapore provides broad-based assistance through Enterprise Development Centres (EDCs), which are set up jointly with the key industry associations and chambers of commerce.

The EDCs provide walk-in diagnostic services and advisory services to help SMEs with their day-to-day business issues and basic upgrading needs. SPRING Singapore will help fund part of the set-up and first-year operation costs of the EDCs.

b) Focused Assistance

Mature SMEs may have more complex upgrading needs that require the engagement of external consultants. Thus they receive focused assistance through the co-funding of upgrading

projects. To qualify for funding, the projects must have an impact and deliver significant and tangible benefits for the SMEs, e.g. IT implementation and quality management systems.

c)   **Enhanced Assistance**

Enhanced assistance to cater to SMEs that are growing rapidly and seeking to break into new overseas markets is provided under the Enterprise Capability Development Scheme (ECADS). The scheme aims to encourage development activities within these enterprises. These include the development of new or better products and the improvement of processes, practices and operations that will result in significant productivity gains.

2. InfoComm Local Industry Upgrading Programme (iLIUP)
(Business   Times,   2001;   http://www.ida.gov.sg/idaweb/marketing/infopage. jsp?infopagecategory=factsheet:marketing&versionid=8&infopageid=I772)

Started in 1995, the InfoComm Local Industry Upgrading Programme (iLIUP) is part of IDA's plan to encourage the development of innovative products and services by promoting partnerships between Singapore IT enterprises and MNCs. Through partnership, Singapore enterprises gain access to MNCs' technologies and technical expertise, thus reducing development costs and time-to-market for their products. They are also able to leverage the MNCs' international marketing networks and distribution expertise, for example, using their partners' overseas facilities for road shows or for meetings with potential clients when they travel overseas. This enhances their ability to penetrate global ICT markets. For their part, MNCs increase their local market share by adapting their technologies for locally developed products and services.

iLIUP has generated more than 140 software products and S$37 million of commercial projects from more than 200 local enterprises. As of March 2003, there were 22 MNCs under the iLIUP: Apple, Avaya, BEA Systems, Borland, BearingPoint (formerly KPMG Consulting), CISCO Systems, Computer Associates, Hewlett Packard, IBM, ILOG, InfoTalk, LG CNS, Mercury Interactive, Microsoft, National Computer Systems, NEC, Oracle, Progress Software Corporation, SAP, ScanSoft, Software AG, and SUN Microsystems.

C. E-government aimed at SMEs and trade promotion

Singapore has a history of early adoption of e-government. In 1989 the then Singapore Trade Development Board implemented TradeNet, the world's first electronic, nationwide, paperless trade facilitation and documentation system. In the Annual Global IT Report, an examination of the NRI sub-indices reveals that Singapore received top ranking for government usage and readiness (1st for both). The high ranking of Singapore's e-government services has been corroborated by a number of other surveys (Wong, 2004). The 2004 Accenture e-government survey, for example, revealed that Singapore's e-government services are already among the most mature of all countries surveyed, with Singapore maintaining its second place ranking for the last four years (see figure 37) (Accenture, 2004). Moreover, in 2003 and 2004, Singapore, along with Canada, recorded the highest growth in usage of e-government transactions. Seventy-five percent of Singaporeans who need to transact with the government do so electronically and four out of five of those who transact online were satisfied. For example, the percentage of regular Internet users who filed their taxes online increased from 33% to 55%.

FIGURE 37
EFFECTIVENESS OF MEASURES TO ENCOURAGE IT USAGE BY SME STATUS
(In percentages)
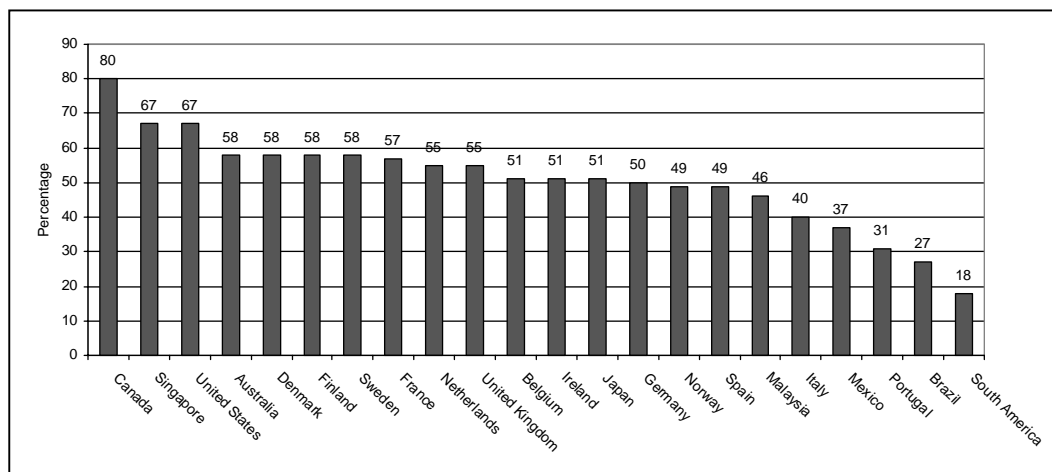
Source: E-government Leadership: High Performance, Maximum Value, downloaded from Accenture website, 2004 <http://www.egov.gov.sg/NR/rdonlyres/B739B208-F894-4C28-9C00-8C01040423D5/3042/ AccentureeGovernment LeadershipStudy.pdf>

1. National e-government plans
(http://www.egov.gov.sg/PlansandStrategies/NationalICTPlans/;
http://www.egov.gov.sg/PlansandStrategies/e-GovernmentPlans/)

a)   Civil Service Computerization Programme (1980-1999)

Singapore's action plans for e-government have evolved together with the country's National IT Plans. The first e-government plan was the Civil Service Computerization Programme (CSCP), conceived with the aim of turning the Singapore Government into a world-class exploiter of IT. It marked the beginning of computerization in the public sector that focused on improving internal operational efficiencies through the automation of traditional work functions and reducing paperwork. The CSCP extended from 1980-1999 covering three National IT plans:

b)   National Computerization Plan (1980-1985)

One of the key objectives of the National Computerization Plan was to implement the CSCP to computerize the major functions in every government ministry. Directed at improving public administration through the effective use of IT, the effort focused on automating traditional work functions, reducing paperwork and escalating the deployment of IT in the public sector. This approach became a catalyst for the widespread acceptance of IT in Singapore. The other objectives were to facilitate the development and growth of the local IT industry, and to develop a pool of IT manpower to meet the future needs of the industry.

c)   National IT Plan (1986-1991)

In the National IT Plan, the focus for e-government shifted to the provision of one-stop services through cross-agency linkages. The enhanced inter-agency communications resulted in the creation of three Data Hubs-Land, People and Establishment. Singapore's use of IT in

automating and integrating traditional manual processes resulted in applications such as School Links, Integrated Land Use System (ILUS), One Stop Change of Address Reporting Services (OSCARS) and networks such as Tradenet, LawNet and MediNet.

d)   IT2000 (1992-1999)

The IT2000 master plan was launched to position Singapore as a global IT hub. Building on the National IT Plan, the expanded focus included improving the quality of life in Singapore, boosting the economy, linking communities locally and globally and enhancing the potential of Singaporeans. In the public sector, greater emphasis was placed on integrating computing resources by consolidating computing facilities in a data centre and through a civil service-wide network. The Internet was used as a new delivery channel to provide information and transaction-based services to the public.

2. E-government action plan (2000-2003)

The first e-government action plan was a key part of InfoComm 21, which was launched to develop Singapore into a global InfoComm capital. The vision of the e-government action plan was to be a leading e-government to serve Singapore and Singaporeans better in the new knowledge-based economy. A total of S$1.5 billion was committed to this plan.

The framework of the plan focused on developing three aspects of e-government (Government to Citizens, Government to Business and Government to Employees) through five strategic thrusts and six programmes (see figure 38):

FIGURE 38
THE E-GOVERNMENT ACTION PLAN STRATEGIC FRAMEWORK
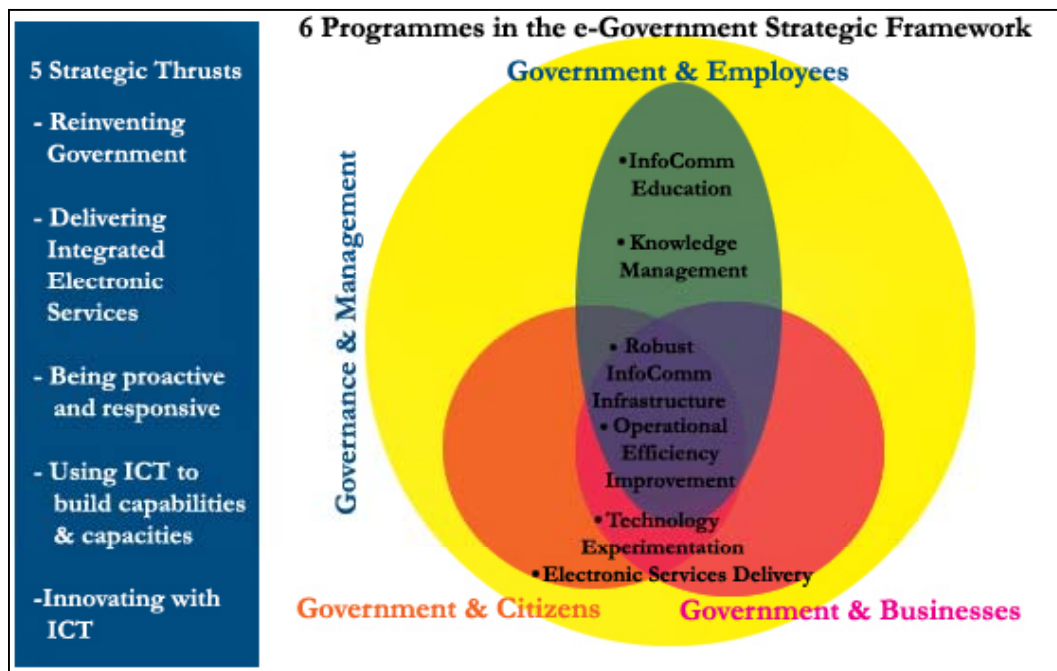
Source: Singapore E-Government website <http://www.egov.gov.sg/PlansandStrategies/e-GovernmentPlans/e-GovernmentActionPlan/>

a)   Government to citizens (G2C)

Individuals can interact online with the Government on a wide range of matters. The eCitizen Portal provides a single access point to government information and services. The portal has grown increasingly popular with individuals and businesses, with hit rates rising from 240,000 per month in October 2001 to 14.4 million hits per month in June 2003.

Behind the success of eCitizen is the Public Service Infrastructure (PSi), a central facility that allows components such as payment, authentication and data exchange to be developed on a 'built-once, reuse-always' basis. This has facilitated quick and efficient deployment of e-services. The time taken to develop such services is reduced from months to days, as government agencies use these building blocks rather than developing their own systems from scratch.

The government also launched a nationwide personal authentication framework for e-services in 2003, known as SingPass, or Singapore Personal Access. Singpass uses a single identification and password, making it easier and more convenient for users to transact online with the Government. All Singapore residents above the age of 15, employment pass holders and their dependants are eligible for SingPass.

b)   Government to businesses (G2B)

The government's G2B efforts have resulted in online transactions between business and the government becoming the norm. The first step in this was the G2B Portal, which gives local and international businesses access to a range of G2B information and services. For ease of navigation, e-services are presented according to business and industry topics. Information on relevant topics such as government assistance programmes, protecting business ideas and market research is also provided. Other services include BizFile, which enables the online filing of such forms in a manner that is both faster and easier for such items as registering a new business entity or reporting changes to business particulars.

This has generated substantial savings in time and money for businesses. For example, incorporating a company now only costs $300 and takes a mere two hours, whereas previously, it would have cost between $1,200 and $35,000 and have taken two days to process (see table 9). Where possible, e-services are integrated across agencies to simplify procedures and improve turnaround time for businesses. By going online, businesses no longer need to liaise with multiple agencies or to fill in multiple forms when requesting government services.

TABLE 9
SAVINGS OF TIME AND MONEY BY SELECTED G2B TRANSACTIONS

Transaction	Previously or manually	Now through e-services
Incorporating a new company	- S$1,200 to S$35,000 (depending on company size) - Time required: 2 days	S$300 (flat fee) Time required: 2 hours
Submitting building plans	- Manual dispatching of documents to 12 agencies	Savings of S$450 by submitting online
Setting up a new entertainment outlet	- Time required: 8 weeks	Time required: 2 weeks

Source: Singapore e-government website <http://www.egov.gov.sg/AwardsandAchievements/ AchievementsinG2B/>

The government also implemented an integrated, end-to-end online procurement system for the public sector, known as Government Electronic Business (GeBIZ). Local and international suppliers can research or participate in business opportunities with the Government in a more efficient, transparent and secure environment. In 2002, the cumulative transaction value of procurement through GeBIZ amounted to about S$262 million.

c)   Government to employees (G2E)

In order to ensure government employees have the skills needed to use e-government, the InfoComm Education Programme (IEP) was launched, teaching employees new ICT skills and competencies, and how to use them to revamp internal processes and external service delivery.

3. E-government action plan II (2003-2006)

The second e-government action plan (eGAP II) was developed in the context of the current ICT plan, connected Singapore, which views ICT as a key enabler to create new ideas that enrich lives and produce new value. eGAP II thus focuses on building the foundations put in place during the first action plan, leveraging existing ICT to ensure that individuals and businesses can derive real benefit from them. Targets have been set to monitor performance in terms of the value it brings to its customers (Accenture, 2004). The three planned outcomes of eGAPII are:

a)   Delighted customers

The Plan aims to please users of e-government, both individuals and businesses, with convenient and easy-to-use e-services. More than 1,600 e-services-all the key government services suitable for electronic delivery-have already been implemented. eGAPII aims to further improve e-services and encourage greater usage of government e-services. Its goals for 2006 are to:

- Implement 12 more cross-agency integrated e-services.
- Have 90% of the Government's customers use e-services at least once a year.
- Have 90% of these users satisfied with the overall quality of e-services.

b)   Connected citizens

ICT will be exploited to explain public policies and their rationale online, and to provide a channel for feedback on policy formulation and review. For example, a Government Consultation Portal allows Singaporeans to voice their opinions on policies and other major issues. For those who wish to volunteer for community services, a centralized portal will be available providing information on community services. Internet-enabling technologies will be used to form new virtual communities, or to support existing ones.

c)   Networked government

The Plan also aims to create a networked government-one that collaborates, shares information and leverages on its collective knowledge. In order to do this, the government will have to enhance ICT management and governance capabilities across the entire public service, and leverage on common architectures and infrastructures to promote cross-agency collaboration and optimize resource allocation. A government-wide policy on data protection has been implemented to ensure the privacy rights of users.

In order to achieve these targets, the government plans to invest S$1.3 billion over the next three years to upgrade infrastructure, develop capabilities and further improve electronic

public services. Part of this includes S$30 million per year which IDA intends to invest in seed pilots and trials that will develop capabilities in areas such as mobile services, web services and portals, wired and wireless network infrastructure (Accenture, 2004).

Since the government has already implemented most feasible e-services, the next step is to promote them further and to provide incentives for users to use them. Publicity and promotional programmes, such as coverage in broadcast and print media, road shows and exhibitions showcasing e-services, advertisements on radio, public transport, newspapers, magazines and posters, handbooks and flyers have all been employed. Other means include offering incentives, such as giving a 20% reduction for online applications for telecommunications dealer class licenses.

Another example is an interactive website for registering new businesses that uses a shopping-cart analogy called "my license cart". Users first choose the type of business to be registered. The website then provides a list of all relevant licenses, permits and administrative matters, from which the user can choose, apply for and add to the shopping cart. At the checkout, the user can view the total amount payable, make a payment via credit card, and then check the status of the application online (Accenture, 2004). These services are clearly of great benefit to SMEs, reducing the resources needed to set up and operate their businesses. Other ways in which government e-services specifically benefit SMEs include the ability for employers with 10 or fewer employees to submit their Central Provident Fund contributions through mobile phones. They can also track the submission status, as well as retrieve their record of payment. For SMEs engaging in international trade, TradeNet has been adapted to comply with recent developments in Singapore's trading obligations, such as the implementation of the ASEAN Harmonized Tariff Nomenclature, the enhanced strategic goods control system, and other requirements related to implementing Singapore's FTAs (IE Singapore, 2003).

V. Conclusion and recommendations

IT usage among Singapore's SMEs is fairly high, especially in basic IT such as computer and Internet usage. However, they have been much slower to adopt new, cutting-edge technologies. There is substantial room for growth in various forms of IT, including network, wireless and e-commerce technologies.

SMEs in Singapore need not only to extend the range of IT they use, but also to exploit more fully the technologies they already have. Existing technology is commonly used for simple operations, such as information searches and e-mail, rather than for production/distribution processes. This is hindering SMEs from extracting the full benefits of their IT in terms of increasing productivity, higher sales and better customer service.

The case studies show that SMEs can derive great benefits from appropriate use of IT. One key element for such success is a conviction that IT is needed for their business, and a willingness to invest resources despite encountering setbacks along the way. Others include paying adequate attention to helping employees learn to use technology and convincing them of its benefits, and working closely with a consultant who understands the SME's industry, business and culture.

They also highlight some of the problems faced by SMEs, especially those in industries that are not highly computerized. A lack of partners with whom they can transact electronically reduces companies' motivation to invest in their own IT resources. Thus one of the main barriers to SMEs' adoption of IT is a lack of perceived need. One means to overcome this problem is to help those already using IT to fully realize their capabilities. They can then be used as models for other SMEs, which will see their relevance to their businesses and be more convinced that the changes needed to implement the technologies are worth their while.

The government has put in place a fairly comprehensive set of policies to assist SMEs in all areas, including their technological development, and its e-government infrastructure is among the most advanced in the world. However, public policy in Singapore still tends to be geared towards MNCs and to high-tech start-ups. SMEs operating in low-technology industries receive less policy attention and yet can also derive great benefit from upgrading their IT resources, particularly with e-commerce, which can help them to expand their markets beyond the limited market available in Singapore.

Some of the forms of assistance needed by SMEs include education to know which forms of IT would best meet the needs of their organization and how to fully exploit them; financial assistance to acquire the technology; and technical assistance to integrate them with their existing systems. Finally, they need assistance in manpower development. The comparatively few resources SMEs spend on IT manpower development is a cause for concern, given the importance of such skills for using and maintaining companies' IT resources efficiently. Thus financial and technical assistance should be given to SMEs for continuous training and upgrading of their IT manpower skills.

References

Accenture (2004), E-Government Leadership: High Performance, Maximum Value, downloaded from website <http://www.egov.gov.sg/NR/rdonlyres/B739B208-F894-4C28-9C00-8C01040423D5/3042/AccentureeGovernmentLeadershipStudy.pdf>

Business Times (2001), "iLIUP scheme to get another $8m from IDA", *Business Times*, 6 October.

Choo, M. (2004), Personal interview, 8 October.

Clancy, H. (2003), "Two Microsoft partners receive best in show recognition", CRN, 11 October, downloaded from <http://www.crn.com/sections/breakingnews/breakingnews.jhtml?articleId=45117&_requestid=90294>.

Computerworld (2003), "Uniseal embarks on a wireless journey", 5-11 December.

Elsevier (no date), Yearbook of World Electronics Data 1990-2004.

IDA (InfoComm Development Authority) (2004), Executive Summary for Annual Survey on InfoComm Usage in Households and by Individuals for 2003, downloaded from IDA website, <http://www.ida.gov.sg/idaweb/doc/download/I2908/HH_Executive_Summary_(Final)_14062004.doc>

_____ Annual Survey of InfoComm Usage in Business (2002), <http://www.ida.gov.sg/idaweb/marketing/index.jsp>

_____ (2002), Quarterly E-Commerce Survey Singapore Q1-Q3 2001, downloaded from IDA website, <http://www.ida.gov.sg/idaweb/doc/download/I761/Quarterly_EC_Survey_(6Mar02).pdf>

_____ (undated), Smart Moves for Wireless Solutions, Singapore.

IE Singapore (International Enterprise Singapore) (2003), Annual Report 2002/2003, Singapore.

Khin, N. (2004a), "Finding the funds to start-up", *Business Times*, 11 October.

_____ (2004b), "Non-tech start-ups get helping hand", *Business Times*, 10 September.

Lim, C. P. (2004), Company prospectus , personal interview, 19 August.

MTI (Ministry of Trade and Industry, Singapore) (undated), Entrepreneurship and International Sub-Committee of the Economic Review Committee <www.mti.gov.sg>

NUS (National University of Singapore) (2003), Annual Survey of InfoComm Usage in Business 2002: Final Report, prepared by NUS for InfoComm Development Authority of Singapore, May.

Reed Electronics Research. (Various years), Yearbook of World Electronics Data Vol. 2: America, Japan & Asia-Pacific, Oxford, U.K.: Elsevier Advanced Technology.

RichLand Group Limited (2003), Annual Report.

RichLand Prospectus (2004).

SingStat (Singapore Department of Statistics) (various years), "Economic Survey of Singapore", *Yearbook of Statistics Singapore,* <http://www.singstat.gov.sg/keystats/hist/gnp.html> <http://www.singstat.gov.sg/FACT/KEYIND/keyind.html>

Singapore E-Government website (undated), <http://www.egov.gov.sg/PlansandStrategies/ e-GovernmentPlans/e-GovernmentActionPlan/>

_____ (undated), <http://www.egov.gov.sg/AwardsandAchievements/AchievementsinG2B/>

SPRING (Standards, Productivity and Innovation Board) <http://www.spring.gov.sg/portal/national _plans/sme21/sme21.html>, <http://www.spring.gov.sg/portal/products/assist/edf/letas.html>

Straits Times (2004), "Keeping Starship Enterprise on course", *The Straits Times*, p. 28, 10 July.

The Edge Singapore (2004), "RichLand drives home solid profits", *The Edge Singapore*, 3 May.

Uniseal Waterproofing website: <http://www.uniseal-waterproofing.com/>

Wong, P. K. (2004), The Information Society and the Developmental State: The Singaporean Model, NUS Entrepreneurship Centre, *Working Paper* WP2004-17, downloaded from <http://www.nus.edu.sg/nec/publications/full_text.htm>

_____ (2003), "From using to creating technology: The evolution of Singapore's national innovation system and the changing role of public policy", in S. Lall and S. Urata (eds.), *Competitiveness, FDI and Technological Activity in East Asia*, p. 191-238. Cheltenham, Northampton: Edward Elgar Publishing.

Wong, P. K and Y. P. Ho (2003), E-Commerce in Singapore: Impetus and Impact of Globalization, NUS Entrepreneurship Centre, *Working Paper* WP2003/03, downloaded from <http://www.nus.edu.sg/nec/publications/full_text.htm>

Wong, P. K. and A. Singh (2002), ICT industry development and diffusion in Southeast Asia, in S. Y. Chia and J. J. Lim (eds.) *Information Technology in Asia: New Development Paradigms*, pp. 48-67, Singapore: Institute of Southeast Asian Studies.

Wong, P. K., F. Wong, L. Lee and Y. P. Ho (2004), Global Entrepreneurship Monitor 2003: Singapore Report, NUS Entrepreneurship Centre, National University of Singapore, April.

WEF (World Economic Forum) (2004), Summit report.

Annex

Mini case studies of wireless IT adoption by SMEs in Singapore[7]

1. Channel Management Systems

Channel Management Systems (CMS) is a local delivery and fulfilment company, providing distribution management (both domestic and overseas), courier services, order fulfilment and inventory management. Previously, job assignments were given to delivery teams according to preset delivery schedules or in response to ad hoc delivery requests. Return documents and payment would then be submitted to the office at the end of the day or the next working day.

CMS deployed a web-based work dispatch management service to manage its mobile workforce better by improving communications and real-time job status tracking. Office administrators log into the system to dispatch jobs, and management is able to view real-time status periodically. Delivery personnel can access job details while they are on the road, and send notifications and work progress reports to the office using WAP-enabled mobile phones. The system also collects and time-stamps the job status and automatically archives it for analysis.

As a result of adopting this system, CMS reaped the following benefits (see annex-table 3):

- Reduced cost by 20%.
- Better customer service.
- Higher sales closing rates.
- Up-to-the-minute visibility of job progress.
- Improved productivity for delivery personnel by 20%, since accurate communication of job details led to faster fulfilment.
- Better decision-making, with improved accountability and management analysis.
- Estimated payback period of one month.

---

[7]   InfoComm Development Authority (IDA), Smart Moves for Wireless Solutions (undated).

2. PestBusters

PestBusters is a leading pest control company in Singapore. PestBusters employed a wireless system as the solution to its excessive paperwork. Past service reports were initially kept in metal filing cabinets. This made knowledge sharing difficult and time consuming, given that the company had a large operational crew (about 70 people) which could be working on more than 50 projects at one time. There was also a widening knowledge gap between operations and management, which led to slower decision-making, reduced operational effectiveness and loss of clientele.

PestBusters adopted a PDA-based solution which allows personnel and customers to access scheduled tasks, customer requests and instruction records. This resulted in a dramatic reduction in paperwork for record keeping. The real-time online system also improved knowledge management and allowed sharing of knowledge between technicians. In addition, management can easily access operational data, thus narrowing the gap between operations and management.

As a result of adopting this system, PestBusters experienced (see also annex-table 3):

- Increased operation productivity through efficient deployment of labour and resources through faster feedback from technicians.
- More time for personnel training and value-added activities, e.g. interaction with customers.
- Faster management decision-making and detection of abnormalities in pest behaviour.
- Increased value of service quality to customers through shorter response time.
- Competitive advantage over other companies through improved customer satisfaction.
- Estimated payback period of two years.

3. Science Arts

Science Arts is a traditional Chinese herbal remedy manufacturer. Previously, orders would be taken manually at the customers' premises, and would only be entered into the system for processing the next day. Order entry, invoicing and picking up goods were all done manually, resulting in long delays before goods could be delivered to customers.

Science Arts implemented a field sales automation solution, which was fully integrated with the company's distribution and accounting system. PDAs are used to exchange data with the backend database through cradle or wireless synchronization. Sales representatives can use PDAs to retrieve product and customer information, such as outstanding orders, invoices, credit and product status, at any time. The system also supports Chinese language display and input, which is an important feature for a traditional Chinese medicine company.

As a result of adopting this system, Science Arts reaped the following benefits (see also annex-table 3):

- Reduced cost by 20%.
- Increased sales by 30%.
- Better customer service.
- Increased sales representatives' productivity by 30%.
- Reduced repetitive orders.
- Shorter turnaround time.
- Estimated payback period of one year.

4. Sin Hwa Dee

Sin Hwa Dee is a leading sauce producer and distributor in the Singapore food manufacturing industry. Although it traditionally relied on manual processing, it found it could not cope with transaction volume – the number of transactions was too large for order entry clerks and customers had to wait longer for orders to be fulfilled.

The company implemented a wireless system to automate its outbound salesmen and van sales operations. Each sales team uses PDAs to enter and store sales transactions. They can also check stock availability and transmit orders to HQ using wireless synchronization when there is a need to make a stock commitment.

The system helped Sin Hwa Dee to (see also annex-table 3):

- Reduce cost by 26%.
- Increase sales by 90%, as salespersons were freed from paperwork, allowing them to devote more time to generating sales.
- Reduce workload of data entry clerks.
- Minimize error-prone manual data entry of sales orders.
- Minimize disputes over stock discrepancies.
- Improve customer service, with the ability to make immediate stock commitment at clients' premises.
- Improve turnaround time for invoice generation by 86% (from 14 hours to two hours).
- Improve credit management, as salespersons can run immediate checks on customer credit status.
- Estimated payback period of one year.

5. Wisescan Engineering

Wisescan Engineering adopted a wireless system to improve the safety of construction sites. In areas with train tunnel networks and adjacent construction works, the tunnels must have real-time monitoring and immediate alert systems when their movements exceed allowable limits. Previously, measured data was stored locally onsite and only retrieved at weekly intervals at night when trains were not operating.

Wisescan Engineering obtained smart Remote Terminal Units (RTUs), wireless communications and mobile phone SMS alerts to fully automate their system information flow. The RTU at the monitoring site sends measured data to the office computer system using a GSM/GPRS data network. By sending the data to the appropriate person, the machine-to-machine (M2M) system signals the alert for corrective action to be taken, thus minimizing risk at the construction site.

As a result of adopting this system, Wisescan Engineering experienced (see annex-table 3):

- Reduced time spent on data retrieval by 75% (savings of more than 500 man-hours per month).
- Estimated savings of $80,000 per year.
- Better and more reliable service with up-to-the-minute visibility of construction progress.
- Increased M2M uptime by using sensors and RTUs to send out fault alerts by wireless in real-time.
- Earlier detection of warning signals. This can potentially save lives and allows structural engineers to take precautionary measures in early stages of stress or danger.

- ▪ Minimized occurrence of human error and time delay in data collection, data analysis and data transmission to the right users.

ANNEX TABLE 1
AGGREGATE ECONOMIC GROWTH PERFORMANCE, 1960-2003
(In percentages of real growth)

	1960-1970	1970-1980	1980-1990	1990-2000
Gross Domestic Product (GDP)	8.7	9.4	7.1	7.5
Labour productivity	n.a	4.3	4.8	3.4

	1997	1998	1999	2000	2001	2002	2003
Gross Domestic Product (GDP)	8.5	0.1	6.9	9.7	-1.9	2.2	1.1
Labour productivity	2.3	-2.7	7.3	5.4	-5.2	3.6	2.3

(S$ at current prices)

	1960	1970	1980	1990
Gross National Income (GNI) *per capita*[a]	1 330	2 825	9 941	20 090

	1997	1998	1999	2000	2001	2002	2003
Gross National Income (GNI) *per capita*[a]	38 850	35 968	36 097	39 599	37 634	37 834	37 555

Source: Calculated from Ministry of Trade and Industry, Singapore (MTI), 1990; Singapore Department of Statistics (SingStat), "Economic Survey of Singapore", *Yearbook of Statistics Singapor,* (various years), <http://www.singstat.gov.sg/keystats/hist/gnp.html> <http://www.singstat.gov.sg/FACT/KEYIND/keyind.html>
[a] Gross National Product (GNP) *per capita* prior to 1997.

ANNEX TABLE 2
SINGAPORE'S GDP DISTRIBUTION BY SECTORS, 1960-2002
(In percentages)

Industry	1960	1970	1980	1990	1995	2000	2002
Agriculture & mining	3.9	2.7	1.5	0.4	0.2	0.1	0.1
Manufacturing	11.7	20.2	28.1	28.0	26.3	25.9	27.4
Utilities	2.4	2.6	2.1	1.9	1.6	1.7	1.8
Construction	3.5	6.8	6.2	5.4	7.0	6.0	5.6
Commerce	33.0	27.4	20.9	16.3	17.3	19.1	15.5
Transport & communication	13.6	10.7	13.5	12.5	12.4	11.1	11.9
Financial & business services	14.4	16.7	18.9	25.5	25.5	25.3	25.3
Other Services	17.6	12.9	8.7	9.9	9.8	10.9	12.4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Calculated from Ministry of Trade and Industry, Singapore (MTI), 1990; Singapore Department of Statistics (SingStat), "Economic Survey of Singapore", *Yearbook of Statistics Singapor,* (various years),

Note: Figures may not add up to 100 due to rounding. Total GDP excludes owner-occupied dwellings and calculations for taxes and duties on imports and imputed bank service charge.

ANNEX TABLE 3
COMPARISON OF BENEFITS OF WIRELESS USAGE FROM MINI CASE STUDIES
(In percentages)

	Channel management systems	PestBusters	Science arts	Sin Hwa Dee	Wisescan engineering
Increased sales			30	90	
Increased productivity	20	Yes	30		
Improved customer service	Yes	Yes	Yes	Yes	
Improved decision-making	Yes	Yes (faster)			
Reduced cost	20		20	26	Savings of $80,000 per year
Reduction in errors					
Reduction in turnaround time		Shorter response time	Yes	86[a]	
Other	- Higher closing rates - Updated information on job progress	- More time for personnel training and value-added activities - Faster detection of abnormalities in pest behaviour - Competitive advantage through customer satisfaction	Reduce repetitive orders	- Reduce data entry workload - Minimize error-prone manual data entry of sales orders - Minimize disputes over stock discrepancies - Improve credit management	- Reduce time spent on data retrieval - Better, more reliable service - Increased M2M uptime - Earlier detection of warning signals - Minimize human error and time delay in data collection, analysis and transmission
Estimated payback period	1 month	2 years	1 year	1 year	n.a.

Source: Smart Moves for Wireless Solutions, Singapore, InfoComm Development Authority (IDA).
Note: The Central Provident Fund is a compulsory pension scheme.
[a] For invoices.

ANNEX TABLE 1
AGGREGATE ECONOMIC GROWTH PERFORMANCE, 1960-2003
(In percentages of real growth and S$ at current prices)

	1960-1970	1970-1980	1980-1990	1990-2000	1997	1998	1999	2000	2001	2002	2003
Gross Domestic Product (GDP)	8.7	9.4	7.1	7.5	8.5	0.1	6.9	9.7	-1.9	2.2	1.1
Labour productivity	n.a	4.3	4.8	3.4	2.3	-2.7	7.3	5.4	-5.2	3.6	2.3

	1960	1970	1980	1990	1997	1998	1999	2000	2001	2002	2003
Gross National Income (GNI) *per capita*[a]	1 330	2 825	9 941	20 090	38 850	35 968	36 097	39 599	37 634	37 834	37 555

Source: Calculated from Ministry of Trade and Industry, Singapore (MTI), 1990; Singapore Department of Statistics (SingStat), "Economic Survey of Singapore", *Yearbook of Statistics Singapor,* (various years), <http://www.singstat.gov.sg/keystats/hist/gnp.html> — <http://www.singstat.gov.sg/FACT/KEYIND/keyind.html>
[a] Gross National Product (GNP) *per capita* prior to 1997.

ANNEX TABLE 2
SINGAPORE'S GDP DISTRIBUTION BY SECTORS, 1960-2002
(In percentages)

Industry	1960	1970	1980	1990	1995	2000	2002
Agriculture & mining	3.9	2.7	1.5	0.4	0.2	0.1	0.1
Manufacturing	11.7	20.2	28.1	28.0	26.3	25.9	27.4
Utilities	2.4	2.6	2.1	1.9	1.6	1.7	1.8
Construction	3.5	6.8	6.2	5.4	7.0	6.0	5.6
Commerce	33.0	27.4	20.9	16.3	17.3	19.1	15.5
Transport & communication	13.6	10.7	13.5	12.5	12.4	11.1	11.9
Financial & business services	14.4	16.7	18.9	25.5	25.5	25.3	25.3
Other Services	17.6	12.9	8.7	9.9	9.8	10.9	12.4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Calculated from Ministry of Trade and Industry, Singapore (MTI), 1990; Singapore Department of Statistics (SingStat), "Economic Survey of Singapore", *Yearbook of Statistics Singapor,* (various years),

Note: Figures may not add up to 100 due to rounding. Total GDP excludes owner-occupied dwellings and calculations for taxes and duties on imports and imputed bank service charge.

ANNEX TABLE 3
COMPARISON OF BENEFITS OF WIRELESS USAGE FROM MINI CASE STUDIES
(In percentages)

	Channel management systems	PestBusters	Science arts	Sin Hwa Dee	Wisescan engineering
Increased sales			30	90	
Increased productivity	20	Yes	30		
Improved customer service	Yes	Yes	Yes	Yes	
Improved decision-making	Yes	Yes (faster)			
Reduced cost	20		20	26	Savings of $80,000 per year
Reduction in errors					
Reduction in turnaround time		Shorter response time	Yes	86[a]	
Other	- Higher closing rates - Updated information on job progress	- More time for personnel training and value-added activities - Faster detection of abnormalities in pest behaviour - Competitive advantage through customer satisfaction	- Reduce repetitive orders	- Reduce data entry workload - Minimize error-prone manual data entry of sales orders - Minimize disputes over stock discrepancies - Improve credit management	- Reduce time spent on data retrieval - Better, more reliable service - Increased M2M uptime - Earlier detection of warning signals - Minimize human error and time delay in data collection, analysis and transmission
Estimated payback period	1 month	2 years	1 year	1 year	n.a.

Source: Smart Moves for Wireless Solutions, Singapore, InfoComm Development Authority (IDA).

Note: The Central Provident Fund is a compulsory pension scheme.

[a] For invoices.