HUMAN RESOURCE DEVELOPMENT (HRD) : TECHNOLOGY & ICT ADOPTION IN INDUSTRIAL SECTOR, MALAYSIA

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ABSTRAK

Peranan Teknologi Komunikasi dan Maklumat (ICT) dalam merancakkan produktiviti dan dapat mempromosikan pembangunan sumber manusia tidak dapat dinafikan lagi. Industri Kecil dan Sederhana (IKS) khususnya, mengambil cabaran ini melalui inovasi teknologi dalam bidang operasi, kecekapan dan produktiviti termasuklah kemampuan sumber manusia. Dalam arus perkembangan yang pesat ini, Malaysia telah mengaplikasikan ICT dalam pelbagai sektor seperti sektor pembuatan, bank, kewangan dan telekomunikasi yang dapat memberikan pengetahuan yang semaksima mungkin kepada pekerja melalui kelebihan penggunaan secara kompetitif kemahiran teknologi dan ICT. Di bawah Rancangan Malaysia Ke-9 (2006-2010) pelaburan yang melibatkan adaptasi teknologi dan ICT dalam pelbagai sektor yang tinggi ini dijangka menjadi pendorong utama ke arah meningkatkan pertumbuhan semua sektor pembuatan. Seterusnya sebagai penyumbang yang lebih tinggi dalam bidang eksport dan mencipta peluang pekerjaan yang lebih banyak kepada pekerja.

Kajian ini telah menilai pembangunan sumber manusia berasaskan aplikasi penggunaan teknologi dan ICT dalam sektor perindustrian di Malaysia. Kajian lapangan ini berbentuk tinjauan dengan menggunakan borang soal selidik. Sampel kajian dipilih secara rawak yang mewakili organisasi industri dan sektor kerajaan di Malaysia. Sejumlah 706 syarikat telah dipilih yang melibatkan proses penghantaran borang soal selidik dan sebanyak 120 sampel berjaya dipunggut iaitu 17% mewakili daripada jumlah populasi. Taburan data daripada sampel ini mencadangkan bahawa perlunya diberi perhatian yang lebih mendalam terhadap sektor ICT. Didapati bahawa tahap penggunaan teknologi yang tinggi tertumpu di kawasan Utara Malaysia. Keputusan kajian menunjukkan bahawa tahap penggunaan IT di kalangan pekerja dalam organisasi berada pada tahap yang sederhana dan separuh daripada pekerja yang dilaporkan memiliki kemahiran IT. Dapatan juga menunjukkan bahawa terdapat penggunaan teknologi dan IT di kalangan pekerja didapati rendah dan hanya separuh daripada pekerja terlibat dalam teknologi atau IT. Akhirnya, kesimpulan menunjukkan bahawa adaptasi ICT memberi sumbangan yang cukup signifikan dalam meningkatkan produktiviti dan kualiti perkhidmatan dalam organisasi atau syarikat.

ABSTRACT

The roles of information and communication technology (ICT) in boosting productivity and in promoting human resource development cannot be underestimated. Small and medium enterprises, in particular, have to grapple with the technological innovations that challenge operations, efficiency, and productivity vis-à-vis human resource capabilities. As in many countries, Malaysia has adopted ICT in various sectors such as manufacturing, banking, finance, and telecommunication, to name a few. These sectors utilize knowledge workers that have technological and ICT skills for competitive advantage. In line with the 9th Malaysia Plan (2006-2010), it was reported that investment from the technology and ICT sector are expected to be the main driver for the manufacturing sector's overall growth, which in turn, could contribute to greater export and create more employment opportunities.

This research assessed the development of human resources based on the application of ICT in the industrial sector in Malaysia. This was a field study in the form of a survey research using a random sample of organizations representing the industrial and government sectors in Malaysia. A total of 706 firms were selected in which questionnaires were sent and 120 usable returns were received representing a 17% response. The distribution of the sample suggests a high concentration of the ICT industry and high technology industry in the central and northern regions of Malaysia. Results of the study showed a moderate number of employees using IT were present in the organizations with more than half of the sample reported having employees with IT skills. There was also a low degree of technology and IT adoption among the sample with only half invested in technology and/or IT. Finally, the findings indicated that ICT adoption had a strong significant impact on the company's productivity and quality of services.

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CHAPTER ONE
BACKGROUND TO THE RESEARCH

1.1 Introduction

This chapter presents the rationale for choosing the study, the objectives of the research, and the importance of the study. A review of the business scenario in the manufacturing sector is presented as well as in the small and medium enterprises.

Today's manufacturing enterprises have to optimize their production in highly competitive and global market place, at an ever increasing rate. In order to survive, they have to confront a multitude of stakeholders' demands, and have to improve the process of product creation, in order to turn an innovation prototype into in manufacture able products, at a much higher speed than ever before. At the same time, the resulting designs for new products should fit manufacturing systems that can cost-effectively produce them. These trends accentuate the significance of knowledge processing in organizations.
In Malaysia, the manufacturing sector has been a major driver of growth for the Malaysian economy since the country's independence. Today, the manufacturing sector's share of total GDP amounts to about 31 per cent, contributes more than 80 per cent of Malaysia's total exports. Given the manufacturing sector's importance, scholars and policy-makers have attempted to ascertain the stage of technological development in the sector. Thus far, most empirical studies on technological development in the country have concentrated on selected industries (notably the electronics and automotive sectors) and firms (Jomo, Felker & Rasiah, 1999).

The SMEs plays a significant role in national economy and in providing employment opportunities. However, SMEs have not received adequate attention from researchers and practitioners with regard to productivity improvements. In a world of global competition, the use of technological resources has become a major strategic challenge for SMEs (Marri, Gunasekaran, and Kobu, 2003). The claim of ICT implementation is critical to SMEs strategies. Although SMEs form a substantial constituent of the global economy, there is limited knowledge available surrounding the adoption of information and communication technologies (ICTs) by SMEs whereby it is only recently that interest in the relationship between SMEs and ICT has begun to be explored in any great depth (European Commission, 1995; Iacovou et, al., 1995).

In the New Millennium, Malaysia is fast moving towards the knowledge economy. This can be further expedited by the industries which encourage innovation, promote competitiveness, and create employment and wealth across society (DTI, 1997). Industries play important roles in leveraging the nation's economy by having a workforce that is highly skilled, trainable in new technology, and knowledgeable, as well as capable to be more innovative, can provide greater flexibility to the economy, and encourage the creation of new jobs. They can also encourage healthy competition both within the domestic and international market. In globalization, it is common that these industries go international with the help of IT and ICT to enable e-commerce and to remain competitive (Westhead et al., 2002).

The Malaysian economy expanded by 7.1% in 2004, the fastest growth since 2000. The economy benefited from both stronger external and domestic demand. Notwithstanding some moderation in global growth in the second half of the year, the Malaysian economy remained resilient with the private sector continuing to be the principal driving force of domestic economic expansions. The overall Federal Government deficit declined to 4.3% of GDP in 2004 (2003:-5.3%). The government, while consolidating, remained supportive of growth with policies targeted at enhancing the business environment for the economy. All sectors registered positive growth during the year except construction. In the manufacturing sector, both export-and-domestic-oriented industries expanded strongly with high capacity utilization, in line with the upturn in the global electronics cycle as well as stronger domestic demand. The services sector experienced a stronger expansion, driven mainly by higher consumer spending administration incomes as well as higher tourist arrivals and increased trade-related activities.

A knowledge-based economy would require a workforce that is highly skillful, learned, possess a positive motivation and attitude, innovative and possess entrepreneurial skill to grab the many opportunities that are widely available as a result of globalization and the proliferation of advanced technology. To achieve this, greater emphasis should be given in enhancing the industrial workforce equipped with academic credentials, technical requirements and the right skills set that can increase their work efficiencies and those with positive work attitude and creativity. These so-called knowledge workers (K-Workers) are vital ingredients for the nation to transform itself into a knowledge-based economy.

The New Millennium or the New Economy is seen as the era of knowledge-based economy and globalization of business. It has shown how the development of information and communication technology (ICT) is changing not only the way business is done but also it changes all walks of life. The availability of computers, mobile phones, e-mails, faxes, internet, web-site information and other electronic media, the businesses are found to be more competitive. The globalization and liberalization of business allow business competitors to move rather freely into any market. In such a case, the market is going to be perfect when all buyers and sellers have easy and access to market information: availability of products, service quality, global competitive prices, access to distribution channels and product promotion. In this "borderless world", it has been realized that it is not only the free flow of goods and services. That is taking place but also the mobility of human resources (workforce). Thus, the business firms that could respond, adopt and adapt to this "new" business challenges are found sustainable and can survive in this "free market" of the "digital-age" era.. On the consumer's perspective, the internet buying is said to be the fastest and easiest shopping activities All in all, in today's era of k-economy, human resource development is focused on the capability of individuals and the organization they support to adapt themselves with the latest information and communication technology (ICT). This is to ensure that the organization is able to compete globally in accordance with the current demands.

Under the 9^{th} Malaysia Plan (2006-2010), it is projected that the manufacturing, the services and the agriculture sector are the main drivers of the growth of the economy. It is expected that the economy will grow at an average of 6% annually for the next five years. It is projected that there is an increase in productivity, competitiveness and valued added in these three focus sectors. In the manufacturing sector, the use and adoption of technology will increase productivity and efficiency. In the service sector, the ICT development in the banking and finance, insurance , transportation, logistics and in the SME sectors. The ICT development focuses on four areas, i.e. digital content, shared services & outsourcing (SSO), e-commerce and bio-informatics. The focus on bioinformatics will be in agriculture, healthcare and industrial sector. The ICT fund provided will enhance the development of ICT in Malaysia.

1.2 Technology Adoption in the Manufacturing Sector

Malaysia's GDP grew mainly from the strength of double-digit export growth and continued government fiscal stimulus. As an oil exporter, Malaysia also benefited from higher petroleum prices. Higher export revenues allowed the country to register a current account surplus. However, foreign exchange reserves have been declining - from a peak of $34.5 billion in April 2000 to $29.7 billion in December 2000. The manufacturing sector contributes to total output of RM 273, 439 million and to value added of RM71, 539 million in 2000 (SMIDEC, 2000). The structure of the manufacturing sector is shown in Table 1.1.

Table 1.1:

The Structure of the Manufacturing Sector in Malaysia

Sector	Output	Value-added		Employment		
	RM (mil)	% share	RM (mil)	% share	Worker	% share
Electrical & Electronics	107, 644	39.4	24, 704	34.5	478, 983	33.1
Food Industries	34, 294	12.5	4, 921	6.9	99, 850	6.9
Wood-based Products	18, 660	6.8	6, 080	8.5	214, 451	14.8
Transport Equipment	15, 326	5.6	4, 268	6.0	51 004	3.5
Rubber-based Products	9, 780	3.6	2, 884	4.0	69, 275	4.8
Textile & Apparel	9, 635	3.5	3, 180	4.4	113, 063	7.8
Machinery	2, 799	1.0	1, 067	1.5	29, 766	2.1
Chemicals (Industry & Others	16, 133	5.9	5, 427	7.6	30, 016	2.0
Iron & Steel Basic Industries	9, 560	3.5	1, 850	2.6	24, 651	1.7
Fabricated Metals	9, 013	3.3	2, 852	4.0	71, 288	4.8
Non Metallic Mineral Products	7, 646	2.8	2, 923	4.1	45, 995	3.2
Plastic	7, 099	2.6	2, 708	3.8	75, 353	5.2
All Remaining Sectors	25, 850	9.5	8, 675	12.1	145, 138	10.1
Total	**273, 439**	**100.0**	**71, 539**	**100.0**	**1, 448, 833**	**100.0**

Source: SMIDP Study Report (2000)

Table 1.2 summarizes the classification of the various industries by their technological characteristics. The effect of market concentration on innovation can be tested by including an industry concentration measure (Lee, 2004).

Table 1.2: Classification of Industry, by Technology Level

Division	Industry	Incidence of Innovation	OECD Product Classification
15	Food Products and Beverages	30	Low-Technology
16	Tobacco Products	50	Low-Technology
17	Textiles	73	Low-Technology
18	Wearing Apparel; Dressing and Dyeing of Fur	28	Low-Technology
19	Tanning and Dressing of Leather; Luggage,	25	Low-Technology
	Handbags, Harness and Footwear		
20	Wood; Products of Wood and Cork Except	16	Low-Technology
	Furniture; Articles of Straw and Plaiting Materials		
21	Paper and Paper Products	38	Low-Technology
22	Publishing, Printing and Reproduction of Recorded Media	52	Low-Technology
23	Coke, Refined Petroleum Products and Nuclear Fuel	100	Low-Technology
24	Chemicals and Chemical Products	42	Low-Medium-Technology
25	Rubber and Plastic Products	41	Low-Medium-Technology
26	Other Non-Metallic Mineral Products	39	Medium-High-Technology
27	Basic Metals	27	Low-Medium-Technology
28	Fabricated Metal Products, Except Machinery and Equipment	29	Low-Medium-Technology
29	Machinery and Equipment N.E.C	10	Medium-High-Technology
30	Office, Accounting and Computing Machinery	50	High-Technology
31	Electrical Machinery and Apparatus N.E.C	67	High-Technology
32	Radio, Television and Communication Equipment and Apparatus	82	High-Technology
33	Medical, Precision and Optical Instruments, Watches & Clocks	75	High-Technology
34	Motor Vehicles, Trailers and Semi Trailers	80	Medium-High-Technology
35	Other Transport Equipment	30	Medium-High-Technology
36	Furniture; Manufacturing N.E.C	28	Low-Technology
37	Recycling	50	NA

Source: Lee; ASEAN Economic Bulletin (2004)

Innovation may be more probable in some industries compared with others. An interesting hypothesis would be that firms in high technology industries are likely to innovate when compared with those in low technological industries. Hatzichronoglu (1997) provides a classification scheme for manufacturing industries that could be used for this research. Using this classification scheme, the present study labelled an industry as one the following:

- low technology;
- medium-low technology;
- medium-high technology ; and
- high technology.

Economists have long stressed the importance of human resources development in influencing productivity and growth of a country (Nelson & Phelps, 1966: Denison, 1967; Walters & Rubinson, 1983; Barro, 1991; Haskel & Martin, 1993). Productivity-driven growth economy requires highly skilled and trainable supply of competent and skilled manpower, essential for the country not only to utilize new technology but also to adapt to imported technology. According to Nelson and Phelps (1966), a country with larger human capital stock would be able to absorb new products and technology discovered elsewhere. Hence, a follower country with more human resources would grow faster because of the ability to catch up rapidly to the technological leader. Similar conclusion was made by Barro (1991) who found that the growth rate of a country is positively related to the starting amount of human capital and poor countries tend to cath up with richer countries if the poor countries have high human capital per person (Fatimah, Saad Mohd, Azhar & Abdul Azid, 2004). Realizing the importance of human capital in enhancing productivity, the government has taken various measures to improve educational and training facilities, which including among others, offered courses in specialized trades to provide workers with skills required for the use and adaptation of modern and high technology production methods and processes

Employment patterns in electronics, especially the semiconductor and telecommunications sectors, are not only influenced by the cyclical tendency of global demand, but also by the changing technologies, automation and flexible production techniques. During the 1970s, employment levels grew steadily without disruptions (Rajah, 1981). During the 1980s, despite the small number of the electronics factories in Penang's FTZs (25 or 18.4% in 1980, 38 or 14.7% in 1984 and 38 or 13.5% in 1987), their contribution to FTZ employment was very significant; about 32 per cent of the 9,877 workers in 1972, and around 49 per cent of the 62,417 workers in the peak year of the 1984 (PDC, unpublished data, 1988). Although falling demand precipitated the decline, the reorganization of production in the semiconductor and telecommunication firms also contributed to the pool of surplus workers. While just-in-time (JIT) reduced sharply the use of labor, automated machinery led also to the recomposition of works tasks resulting in fewer workers handling many more machines, and maintaining quality control as well.

1.3 Technology and ICT Usage in Small and Medium Enterprises (SMEs)

According to Hall (2004), the East Asia region has been subject to enormous turbulence from international sources over the last decade. The 1997 Asian Financial

Crisis, then 2001 Tech Wreck, SARS in 2003, and then continuing effects of terrorism and currency volatility in the region have all contributed to a turbulent ride. There is no sign that this turbulence will abate. Turbulence and volatility are not in themselves necessarily bad. Although the impact of turbulence is no doubt painful for those directly affected, turbulence can offer opportunities for structural adjustments to take place. For example, a comparison of the role and performance of SMEs in Korea and Taiwan during the 1990s and early 2000s shows that the reputation for SMEs to be flexible in the face of adversity is well deserved, but should not be taken for granted. Resilience is a characteristic of many SMEs. The adjustment process in response to turbulence and disruption can open up opportunities by breaking down barriers and in doing so, allow for longer term benefits. Provided the SME sector is able to take advantage of the opportunities that arise, and provided SME have incentives to exist from low-opportunity areas without bearing unreasonable cost, then the SME sector actually seems to be able to perform better under turbulence. This process is assisted by a good SME policy framework, which makes it more likely that SMEs can take advantage of the opportunities created by turbulence. The recent experience of Korea, and to a lesser extent Taiwan, appears to have borne this out (Hall & Harvie, 2003).

SMEs play a significant role in national economy and in providing employment opportunities. However, SMEs have not received adequate attention from researchers and practitioners with regard to productivity improvements. In a world of global competition, the use of technological resources has become a major strategic challenge for SMEs (Marri, Gunasekaran, & Kobu, 2003). The claim of ICT implementation is critical to

SMEs strategies because the absence of suitable and sufficient knowledge on this topic exposes a “rhetoric versus reality” argument (Shiels, McIvor & O’Reilly, 2003). As part of the efforts to nurture the development of small and medium-scale enterprises (SMEs) in view of their strong growth potential, Bank Negara Malaysia intiated the establishment of the National SME Development Council in 2004, chaired by the Prime Minister. The Council represents the highest policy-making body and will chart the future direction and strategies for SME development in Malaysia. Bank Negara Malaysia is the Secretariat of the Council. During the year, the Council standardized the definition of SMEs across all sectors of the economy and took initiatives to improve information on SMEs as first steps towards more effective policy formulation and implementation. The Council also initiated programs to strengthen the enabling infrastructure for SMEs in areas of access to financing, training and human resources development, management as well as marketing. Of significance is that the Council approved the establishment of a SME Development Bank to complement the banking institution in providing financial and non-financial services to SMEs (Bank Negara Malaysia, 2004).

SMEs continued to receive strong financial support from the banking sector in 2004. New loans approved increased during the year by 21.9% to RM 31.6 billion and were channeled to more than 92,000 SME accounts. Similarly, loan disbursement to SMEs also expanded strongly by 15.3% to RM100.4 billion. By end-2-4, outstanding loans to SMEs expanded by 7.7% and accounted for 40.3% of total outstanding loans to businesses (1998: 27%). In reinforcing the financial assistance to SMEs, Bank Negara Malaysia increased further the allocation of funds to fund for Small and Medium

Industries 2 and the New Entrepreneurs Fund 2, enlarging the five special funds managed by Bank Negara Malaysia to RM8.9 billion (Bank Negara Malaysia, 2004).

SMEs play an important role in providing linkages to export-oriented industries in Malaysian economy. The SMEs are expected to contribute significantly in terms of value added and labor absorption in economic growth, particularly in the manufacturing sector, as driver of growth It is estimated that there are 11,292 SMEs in Malay via of which 88% are small enterprises and 12% are medium enterprises. As such a number of small and medium industries are expected to be around 20,000 and is said to dominate the manufacturing sector in the country. Although the number of new small business entrants and participations seem to increase, problems and constraints faced by the small businesses, particularly in getting business financing and loans from the commercial banks are not deniable. Issues on small business problems relating to lack of capital and financing difficulties, lack of sales and marketing mechanisms, low technology used, skill workers, production capacity, low quality of products and services, inadequate supply of material and competition are often raised by the entrepreneurs and usually discussed and debated among the entrepreneurs, the government, and the private sector representatives.

In Malaysia, there is a distinction between small and medium scale enterprises (SMEs) and small scale industries (SMIs). The SMEs are usually referred to those involved in non-manufacturing activities and usually are business traders of finished goods and services. The business activities involve: wholesale, distribution, retailing, contractors, food processing, farming, financing and mining. There are also "informal" traders/ micro business/ street traders participating in the economy.

SMIs are usually defined and referred to those involved in the manufacturing/production/processing/engineering sectors. In Malaysia, SMIs are classified according to the following criteria, namely, numbers of workers, sale volume, net asset, capital and local equity as shown in Table 1.3 (MITI, 1992).

Table 1.3: Classification of SMIs in Malaysia

Criteria	Small Scale Industry	Medium Scale Industry
Employees	49 and bellow	50-199
Sales Volume	RM3 million and below	RM 3 million – RM10.00
Net Asset	RM1 million and below	RM 1miiliom – RM10 million
Capital	0.5 million and below	RM 0.5 million - RM2.5 million
Local Equity	above 70%	above 70%

The SMIDP (2000) defines SMEs in the manufacturing and manufacturing related services as having annual sales turnover not exceeding RM25 million or full-time employees not exceeding 150. As shown in Table 1.3, SMEs accounted for 93.8 per cent of all establishments in the manufacturing sector and contributed to:

- 27.3 per cent to manufacturing output;
- 25.8 per cent to value-added;
- 27.6 per cent of fixed assets; and

- 38.9 per cent of employment

Table 1.4 shows the total number of SMEs, of which small enterprises comprised 76.0 per cent, while medium companies accounted for 17.8 per cent of all manufacturing establishments. In terms of manufacturing input and employment, small enterprises accounted for 3.9 per cent, and 11. 4 per cent, while medium firms contributed 23.4 per cent and 27. 5 per cent respectively. More than half, or 58 per cent of the small establishments, generated less than RM5 million in output annually and employed less than 25 workers.

Table 1.4: Principal statistic of manufacturing sector, 1996

		% Share by Size of Firm				
	Total	**Small**	**Medium**	**SMEs**	**Large**	**Total**
No. of Firm	20, 204	76.0	17.8	93.8	6.2	100.0
Output (RM million)	273, 439	3.9	23.4	27.3	72.7	100.0
Cost of Input (RM million)	201, 901	3.6	24.2	27.8	72.2	100.0
Value-added (RM million)	71, 538	4.7	21.1	25.8	74.1	100.0
Workers ('000)	1, 449	11.4	27.5	38.9	61.1	100.0
Salaries (RM million)	19,170	8.2	24.8	33.0	67.0	100.0
Fixed Assets (RM million)	112, 831	4.0	23.6	27.6	72.4	100.0

Source: SMIDP Study Report (2000)

Reports on the current scenario of technology and ICT development of SMIs in Malaysia have not been encouraging. SMIs in Malaysia are still operating in the traditional way with mostly family-based (Hodge, 2001), using traditional and obsolete technology to produce cheap and low quality products with limited market penetration.

Among the problems faced by SMIs include lack of able personnel to negotiate fundings (Chee, 1979), lack of expertise in using and managing technology (Raymond, 1990 & Anderson, 1987), lack of skilled workers (Moha Asri et al., 2000), low level of IT skills and knowledge (Hussein & Zulkhairi, 2004), and poor user attitude towards technology (Lees & Lees, 1987). In today's era of K-economy, the organizations are competing globally relying on their competitive advantage of the latest technology and ICT capabilities they developed and enhanced.

In the case of SMEs, various business problems facing the SMEs are often being mentioned. These include small market shares, lack of capital fund, improper accounting systems, low and outdated technology, and unavailability of skilled and competent workers. Although various SME assistance programs are formulated and implemented by various government agencies and the big corporations, these problems are yet to be solved. This paper also highlights the importance of E-Commerce and its impact that need serious attention by the SMEs. The advantages of E-Commerce to SMEs are numerous. These include increasing market development and deepening market penetration, reduction in operation and administration costs, enhancing service and product quality as well as improving the Business to Business (B2B) , Customer to Business (C2B), Customer to Customer (C2C) and Business to Customer (B2C) relationships.

1.4 Technology and ICT Development

The ICT expenditure by sector is shown in Table 1.5. In the manufacturing sector, the average annual growth rate of ICT expenditure is 19.0 per cent while in the distribution sector, the annual growth rate is 16.4 per cent.

Table 1.5: ICT Expenditure By Sector, 1995 – 2000 (RM Million)

Sector	**1995**	**%**	**2000**	**%**	**1996 - 2000**	**%**	**Average Annual Growth Rate (%) 1996 - 2000**
Banking	1026	27.2	827	14.0	3723	15.0	-4.2
Manufacturing Sector	**494**	**13.1**	**1182**	**20.0**	**4041**	**16.3**	**19.0**
Government	380	10.1	532	9.0	2062	8.3	6.9
Telecommunication	-	-	473	8.0	2323	9.3	-
Distribution	**304**	**8.1**	**650**	**11.0**	**2586**	**10.4**	**16.4**
Oil & Gas	380	10.1	296	5.0	1623	6.5	-4.8
Utilities	266	7.0	236	4.0	1253	5.0	-2.3
Profesional ICT & OtherServices	**125**	**3.3**	**236**	**4.0**	**236**	**1.0**	**13.5**
Healtcare	-	-	59	1.0	59	0.2	-
Education & Research	**114**	**3.0**	**236**	**4.0**	**1008**	**4.0**	**15.6**
Transportation	114	3.0	177	3.0	1147	4.6	9.1
Home	**76**	**2.0**	**473**	**8.0**	**2004**	**8.0**	**44.1**
Plantation & Mining	76	2.0	-	-	100	0.4	-
Others	418	11.1	532	9.0	2736	11.0	4.9
Total	**3773**	**100.0**	**5909**	**100.0**	**24901**	**100.0**	**9.2**

Source: The 8th Malaysia Plan Report and (http://www.pikom.org.my)

One area of Malaysia's telecommunications industry that has been prospering is the wireless phone market. At the end of 2002, Malaysia is cellular penetration rate was about 30%, or about 7 million users - one of the highest in the region. The cellular market continues to grow and is anticipated to register double-digit growth rate over the next few years. As of 2002, there are five mobile networks operators: Celcom, Maxis, Digi, TM Touch and TimeCel. There were many concerns for having five domestic service networks in a country of 23 million people for their cost, duplication and commercial viability. Currently, there are only three main players, namely Celcom, Maxis and Digi. Telekom Malaysia is the dominant fixed telecommunication service provider. It has more than 3 million customers with multibillion-ringgit investment programs to upgrade and modernize its network. It first introduced cellular communication in the country in 1985 via Atur 450. More recently in 2002, Telekom Malaysia merged its mobile phone business, TM Touch with Celcom in response to the Government's call to consolidate the telecommunications industry to bring about greater efficiency in the mobile communications segment.

With the advent of the Internet, Malaysia has made a concerted effort to get connected. Jaring (Joint Advanced Research Integrated Networking) has been established as the main gateway to Malaysia's information highway, which is owned and operated by the Malaysian Institute of Microelectronics Systems (MIMOS) and uses Telekom's infrastructure for its operations. Subsequently, at the end of 2002, there were over 4.8 million Internet users in Malaysia, representing approximately 19% of the population.

As in many other countries, computers are widely used in Malaysia in various sectors such as manufacturing, banking, finance, and telecommunication, to name a few. These sectors utilize knowledge workers that have technological and ICT skills for competitive advantage. In the small and medium industries (SMIs) in Malaysia, not many researchers have conducted studies to explore how ICT contributes to human resource development. It is therefore the primary intention of this research to examine technology and ICT adoption in production manufacturing sector in Malaysia.

The employment effects of information and communication technologies have been a major cause for concern from the early stages of the development and adoption of ICTs in various economic activities. From the outset, there was apprehension that the adoption of these technologies might leads to job losses, particularly among semi-skilled or unskilled workers, through the automation of routine task by ICT tools programmed to handle multiple jobs (Nilsen, 1980) in Lal (2004).

Over the same period there have been many proponents of the counter-argument that ICTs would lead to the creation of many new jobs and give rise to new industries and services (Talero and Gaudette, 1995). Rada (1982) and Kuwahara (1984) found that the adoption of IT leads to the creation of new jobs in some production processes, and a loss of workplaces in other activities at the enterprise level from a static perspective. The authors also found evidence of the emergence of new firms dealing with ICT related activities, external to the existing enterprises. For instance, several new consultancy firms have emerged in the garment sector to provide technical input and technological support to garment manufacturing firms. Although they provide training and consultancy services in other manufacturing technologies used within the sector, these new firms tend to concentrate on the new ICT-based technologies (Lal, 2004).

The adoption of ICTs in labor-intensive activities is expected to result in the displacement of labor, while creating a few new jobs for skilled workers needed to maintain the ICT tools. The adoption of ICTs may be neutral in labor use if it is possible to achieve expansion of markets for existing products, or to create markets for new products manufactured on the same assembly lines as a result of increased efficiencies brought by ICTs. This may apply at the enterprise level itself, but even more at higher levels of aggregation. Where market expansion is possible, the adoption of ICTs could lead to the creation of employment for skilled workers and if the market expands fast enough, there may not be a loss of jobs for unskilled workers. However, firms may need to undergo some organizational changes and workers may require training to upgrade their skills in order to use ICT tools effectively (Lal, 2004).

The competence (capability) is both a requirement for, and a consequence of, participation. It is a requirement because participation needs a minimum level skill in order to be effective. It is a consequence because participation enhances the skills levels of those involved. Participation as a process has advantageous results for both individuals in terms of capability and job satisfaction, and for the organizations, in terms of core competence, increased efficiency and effectiveness. If a company wants to make efficient use of knowledge and intends to cause the knowledge, skills and experience of its employees to become more effective to achieving organizational goals, the two perspectives on intellectual capital management, organizational and individual competencies, should be aligned. The local knowledge of workers, locked in their traditions and work habits, may be successfully tapped and communicated by using ICT-supported participative simulation.

Under the 9th Malaysia Plan (2006-2010) the government will boost the adoption and use of ICT in the country. The number of MSC status companies is projected to grow from 1421 as at 2005 to some 4,000 by 2010 and these are expected to create 100,000 new jobs and generate about 1,400 new intellectual properties.

1.5 Research Objectives

This research attempted to determine technology and ICT adoption in the industrial sectors in Malaysia. Specifically, the study attempted to:

1) Identify the level of ICT and technology usage in industrial sectors.
2) Ascertain the manpower requirements on ICT and technology in industrial sectors.
3) Evaluate the levels of ICT and technology training received and its relationship to productivity.

1.6 Significance of the Study

The importance of this research could be expressed in the following context:

1) Through this study, the number and kinds of employees required to work in certain industries in Malaysia would be identified, thus contributing to proper, appropriate, and well-defined manpower planning activities and programs.
2) The findings of this research also hope to provide managerial and policy directions in terms of human resource development vis-à-vis the company needs and structure, and address the need for knowledge workers in today’s competitive work environment.
3) Moreover, the outcome of this study would afford practical suggestions and guidelines on manpower development programs, policies, and practices, among others, in the context of industrial development, such as technology and ICT adoption.
4) In addition, the results of this research would suggest appropriate human resource planning strategies as companies gear toward technology and ICT adoption and development.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter presents literature and studies related to the present research. It highlights the importance of ICT and the adoption of technology in business operation, efficiency, and productivity. Local and original studies were also examined and their impact to human resource development.

2.2 National ICT Policy and Regulatory Framework

A Steering Committee on National Information Technology Policy (DTMN) was formed in 1989 to coordinate the formulation of an ICT policy. Not until 1994 when the NITC was formed, that a more serious effort was made towards a policy creation. NITC initiated the process of formulating a national IT plan and identifying key programs that will contribute to the transformation of Malaysian society into a knowledge-based society. The National IT Agenda (NITA), launched in December 1996 by the National IT Council (NITC), provides the foundation and framework for the utilization of information and communication technology (ICT) to transform Malaysia into a developed nation in our own mould consistent with Vision 2020. Chaired by the Prime Minister, the NITC comprises members from the public, private and community-interest sectors and functions as a think tank that advises the government on ICT strategy. MIMOS Berhad, as the Secretariat to the NITC, assists and supports the Council's activities, including the development and realization of NITA. The National ICT Policy and Regulatory Framework is shown in Fig. 7.1.

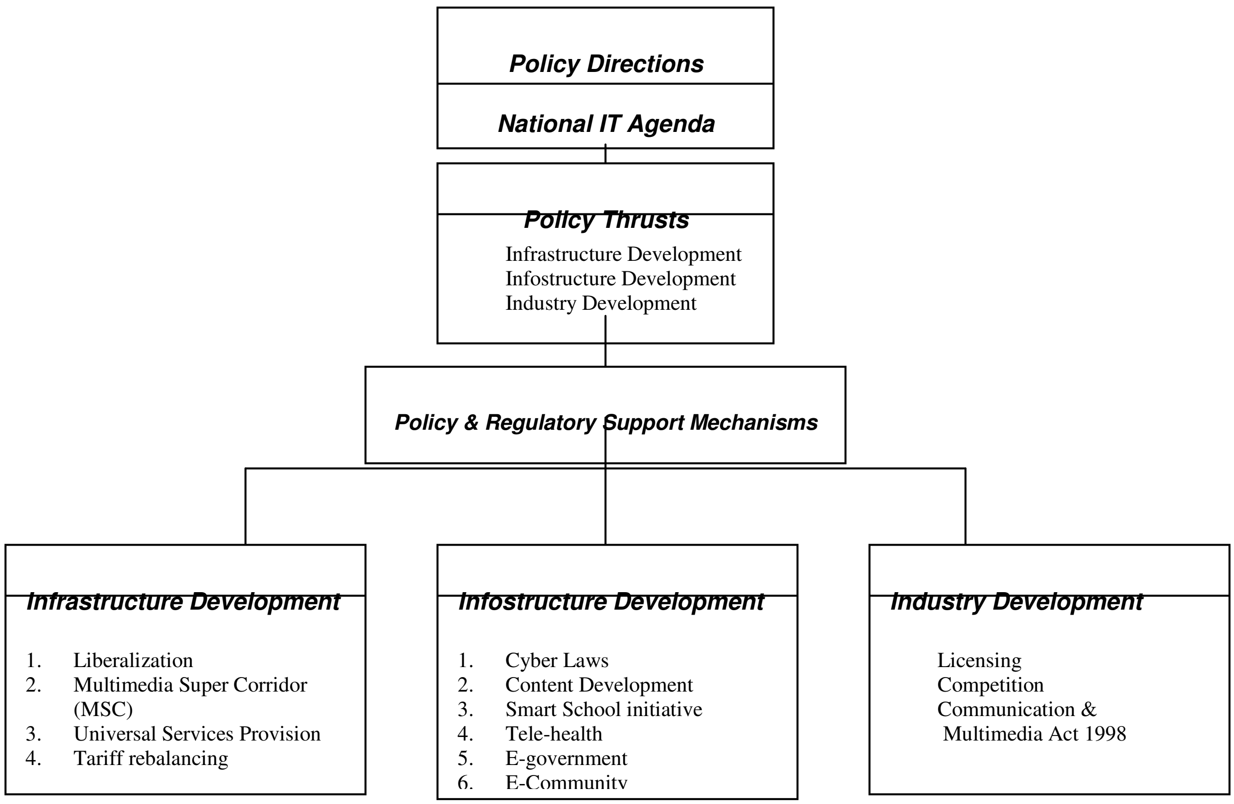

Figure 7.1:
Overview of National ICT Policy and Regulatory Framework in Malaysia

The NITA vision is to utilize ICT to transform all Malaysian society into an information society, then to a knowledge society and finally to a values-based knowledge society. With the theme "Turning Ripples into Tidal Waves", NITA focuses on the development of people, infostructure and applications to create value, to provide equity and access to all Malaysians, and to qualitatively transform our society into a values-based knowledge society by the year 2020.

The "ripples" are focused initiatives by the government to create the necessary environment and empower the people, so that they will bring about the tidal wave of changes required to achieve the NITA vision. The Multimedia Super Corridor (MSC), the earliest strategic initiative of the NITC, is such a "ripple". Acknowledging the need to involve all Malaysians in the NITA process, another major "ripple" initiated by the NITC is the Demonstrator Application Grant Scheme (DAGS), which encourages Malaysians to participate in and utilize the opportunities made available by ICT. MIMOS Berhad, as Secretariat, manages and administers the DAGS.

As an added aspect of NITA realization, the NITC has formulated the NITC Strategic Agenda - a strategy for Malaysia's migration to the E-World of the new millennium. The strategy involves an orderly transformation from the current governance structure to a participatorier one involving active tripartite partnership between the public, private and community-interest sectors. The Strategic Agenda highlights the need to address five areas critical to our migration to the E-World, namely E-Community, E-Public Services, E-Learning, E-Economy and E-Sovereignty.

The NITC promotes the notion that knowledge and information will be the most valuable assets in the economy of the new millennium. For Malaysia to be competitive, we must embrace the knowledge-based economy (k-economy) and create word class Malaysian enterprises that can compete globally with the edge in price, quality, delivery and costs. NITA holds the key to empowering the nation and enabling the emergence of this new breed of entrepreneurs. NITA is the foundation for Malaysia's success in the information age and beyond.

It was only in 1997 that an integrated direction was outlined in the National Information Technology Agenda (NITA). The objective of NITA is to shape a Malaysian civil society who uses information, knowledgeable and apply proper value systems. NITA focuses on three elements: the development of human, information infrastructure, and applications. NITA is structured in a way that it takes into cognizance applications, MSC, IT programs, as well as dialogues and feedback mechanisms involving national leaders, Government agencies and the private sector. However, NITA looks at the macro level of IT direction and guidelines for implementation.

At the more operational level, procedures and guidelines in existence since the eighties are still applicable. For Government sector, a Computerization Guideline Manual for management for the public sector has been in use and coordinated by MAMPU since its introduction in 1988. It covers procurement procedures, IT Standards, IT services, security and issues to be addressed in the implementation of IT plans in Government agencies. This guideline supports the Science and Technology Policy, which include computerization as one of its strategy. The National Policy for Library and Information Services is another policy that relates to information management implementation. Another related policy relevant to IT implementation guideline is the National Telecommunications Policy (NTP).

2.3 ICT and Technology Adoption

A study by Idris, Abdul Latif and Haron (2002), in their investigation to gauge SMEs' awareness of available financing facilities in Malaysia, discovered that there is an information gap on the leading facilities available and provided by the government agencies and participating commercial banks to the SMEs. The study discovered that more than half of the respondents (62%) did not understand or were not aware of the existing SMEs' financing facilities. Efforts therefore must be made to market these facilities more aggressively as well as investigating whether the facilities have been designed and delivered by taking into account the target group's characteristics and financial predisposition.

Licht and Moch (1999) found that information technology has important impacts on the qualitative aspects of service innovation. Hempell (2002) found that firms that have introduced process innovation in the past are particularly successful in using ICT; the output elasticity of ICT capital for these firms is estimated to be about 12 per cent, about four times that of other firms. This suggests that the productive use of ICT is closely linked to innovation in general, and to the re-engineering of processes in particular. Studies in other countries also confirm this link. For example, Greenan and Guellec (1998) found that organizational change and the uptake of advanced technologies (which assume that ICT investment has been made) seemed to increase the ability of firms to adjust to changing market conditions through technological innovation.

According to Fuller (1996), the computers and software programs (information technology or IT), are business tools which can be used, for example, to reduce costs, create stronger linkages with customers, innovate, and facilitate niche marketing. The term adoption is used generically to include the purchase of IT equipment and software, and the implementation of this in the individual enterprise. The terms 'infusion' and 'absorption' are also used to describe the increasing use and involvement of IT in the individual enterprise.

The awareness among ownership for belongs with workers use of computers by small business is increasing in many countries. A study by Burns and Hatter (1992) in MORI, United Kingdom indicated that approximately half with a sample of 201 business with under 10 employees had at least one personal computer. Then, Chen and Williams (1991) found that 55 per cent of their sample (with less than 50 employees) had computers, with younger companies more likely to own them. They contrasted their findings with several from North America which indicated much lower percentage of ownership by smaller firms. A survey of firms in west London in 1992 found that 33 per cent of firms (a representative sample of 200) with 1-24 employees used IT with a further 14 per cent planning to use IT in the near future (Fuller, 1996).

A study by Shiels, McIvor and O'Reilly (2003) looked at the phenomenon of the internet which has forced business and organizations to examine their existing business practices and adopt new methods of working, both for existing and potential customers. It also analyzed the sophistication of adoption and exploitation of ICTs, using a sample of

24 case study SMEs. As this study attempted to investigate those companies using ICTs to support their business processes, it was imperative that the subjects were selected from companies already employing ICTs in their business processes. From the analysis of the pilot study, findings highlight that the characteristic of the firm and the industry sector are contributory factors to the extent of adoption and exploitation of ICTs by SMEs, to support business processes.

The effective and efficient use of this information technology integration, in turn, depends upon purposely built infrastructure that incorporates the relevant business knowledge base, control of processes and activities, and allows the necessary and continuous training to produce knowledgeable skilled workers. With the right combination of knowledge base, skills and competencies, managers would be better equipped with the resources to make the necessary planning that will maintain or enhance the firm's competitive positions. In this respect, SMEs should consider information technology (IT) integration as an important approach in their competitive position (Mutsaers, Van Der Zee, & Giertz, 1998). IT integration can be defined as the use of computer-based technological hardware, data, and software applications that is shared and accessed for organizational use over a communication network (Wyse & Higgins, 1993).

The role of IT in such organizations is vital because it contributes to the fundamental changes that are needed for production, co-ordination, and management towards achieving these goals (Morton, 1991). IT helps organizations in pursuit of quality improvements to design goods that are easier to manufacture, improve new product cycle time through cross-functional integration of systems, and use electronic networks to speed up communications internally, with suppliers, and customers. The effect of integrating information technology is to add value to the efforts of the organization in their pursuit for productivity improvements by providing an efficient means of generating the required information to make the necessary decisions and take appropriate actions (Nolan, 1995).

Forth and Mason (2004) studied about information and communication technology adoption and utilization, skill constraints and firm-level performance in the United Kingdom. The study hypothesized that firms with relatively high (low) proportions of skilled workers can be expected to have a comparative advantage (disadvantage) in minimizing the cost both of ICT adoption and of learning how to make best use of ICTs. The benchmarking survey data for UK enterprises between 1997-1999, provided clear evidence that ICT skill constraints have an indirect negative impact on firm performance as s result of the restrictions that such skill deficiencies place on ICT adoption and on the intensity of use of ICTs (once they have been installed).

Peansupap and Walker (2005) studied on factors affecting ICT diffusion in three large Australian construction contractors. The study of ICT diffusion within construction organizations consisted of two phases: gathering quantitative and qualitative data. In order to understand ICT diffusion within construction organizations, a case study methodology was adopted. The reason for choosing this methodology was to provide qualitative data that could understand better how ICT is initiated within construction organizations and to expose factors that supported ICT diffusion. The data collection from the case interviews were conducted from October 2002 to May 2003. Phase 1 of the research comprised one contractor, one consulting engineering organization and a government department. In phase 2, three large main construction contractors were interested in participating in this research, including the contractor from phase 1. The research team conducted semi-structured interviews. To receive the from cross-organizations, data were collected from the ICT application implementer/facilitator and five to six professional users including project managers, engineers, and foremen. Each interview took approximately 30-35 minutes. Results from the study found that 11 factors influence ICT diffusion. The report on phase 2 study result within three construction organizations based on the 11 factors found to influence ICT diffusion. Semi-structured interviews were undertaken with five to six ICT users and an implementer for each of the case study companies. It is clear that people diffuse ICT innovation and they must feel motivated to do so. This introduces the importance of support mechanisms that includes not only technical solutions such as superior hardware and software operational features, but also software support that is championed by supervisors who behave as role models.

2.4 Attitude Towards ICT and Technology Adoption

The employee attitude towards the use of IT integrated resources is also an issue worth considering when implementing the IT integrated infrastructure. The literature reveals that the nature of the employee behavior attitude can have a significant effect on the integration of these technologies in the business processes (Henry, 1994). At the same time, the management, too, needs to believe the value of integrated IT resources. Company executives should articulate their goals for IT integration and identify areas within the corporation where the IT integration could create value. This heightened sense of awareness by the management as to how IT integration can change the fortunes of the corporation explains why IT integration is viewed as a valuable business resource to be managed rather than an overhead expense to be minimized (Tallon, Kramer & Gurbaxani, 2000).

Mazuki, Mohd Rizal and Maimun (2004) studied the integration of information technology among 106 small and medium-sized enterprises in Malaysia. A survey was conducted through structured personal interviews and electronic mails among Master of Business Administration graduates of a private university. The study looked at the relationships between IT integration and the performance efficiency of value chain activities and the environmental and organizational factors that effect IT integration among SMEs. The results found that the higher levels of IT integration among manufacturing companies, those which produce high technological goods and services and had management and employees towards computers technologies and systems are also found to result in higher integration levels. The overall correlation is significant to substantiate the hypothesis that higher levels of IT integration leads to better performance efficiencies in all functional areas. In terms of organization size, SMEs with larger number of employees have higher levels of IT integration. This is because the successful organizations are those that have a clear and agreed strategic vision and a relatively clear and agreed means of progressing towards this vision because a clear mission statement is essential for effectively establishing objectives and formulating strategies (Mazuki, Mohd Rizal & Maimun, 2004).

The integration of ICT in companies leads also to the dependence of firms on computer-aided design and manufacturing and knowledge of a range of advanced technologies including electronics, advanced material and software. Until the 1980s, firms in sectors such as mechanical and electrical engineering depended mainly on the skills of their designers, draftsmen, production engineers and draftsmen for their technology. The various stages of the production and distribution process, along with the interfaces between organizations in the supply-chain, are now codified and managed electronically. As a result, traditional craft and production engineering skills for example have been replaced by computer design skills, and the ability to integrate successfully the various elements of computer-controlled work and information flows within and across company boundaries is now a key competence in many industries (Clarke, 2001).

A substantial number of firm-level studies address the interaction between technology and human capital, then their joint impact on productivity performance. In the United States, Kruger (1993) found that workers using computers were better paid than those that do not use computers. A study by Doms, Dunne and Troske (1997) found no correlation between technology adoption and wages, however, concluded that technologically advanced plants pay higher wages both before and after the adoption of new technologies. A more recent study by Luque and Miranda (2000) found that technological change in US manufacturing sector was skill-biased.

The study by Entorf and Kramarz (1998) found that computer-based technologies are often used by workers with higher skills. These workers become more productive when they get more experience. In using these technologies, Caroli and Van Reenen (1999) found that French plants that introduce organizational change are more likely to reduce their demand for unskilled workers than those that do not. Shortages in skilled workers may reduce the probability of organizational changes. Greenen, Mairesse and Topiol-Bensaid (2001) found strong positive correlation between indicators of computerization and research on the one hand, and productivity, average wages and the share of administrative managers on the other hand. They also found negative correlations between these an indicators and the share of blue-collar workers.

Haskel and Heden (1999) in the United States found that computerization reduces the demand for manual workers, even when controlling for endogeneity, human capital upgrading and technological opportunities. In addition, Caroli and Van Reenen (1999) found evidence that human capital, technology and organizational change are complementary, and that organizational change reduces the demand for unskilled workers. This evidence was supported by Baldwin, Gray and Johnson (1995) who found that the use of advanced technology was associated with a higher level of skill requirement, leading to a higher incidence of training and increased expenditure on education and training. A more recent study (Sabourin, 2001) found that establishments adopting advanced technologies often reported labor shortages of scientists, engineers and technical specialists. However, the most technologically advanced establishments were often able to solve these shortages (Pilat & Wyckoff, 2003).

The study in human resource development and integrated manufacturing system among SMEs has been examined by a number of researchers, Sun (2001), for example, examined human resource development versus the level of computerized integration and automation. Specifically, it concerns the relationship between technology and organization/human resources associated with integrated manufacturing. Research on this topic has been given fresh impetus by the advent of computer-integrated manufacturing (CIM). CIM is the term used to describe the modern approach of manufacturing (Singh, 199; Kotha & Swamidass, 1998). The main feature of CIM is the integration of all manufacturing functions, including design, engineering, planning, control, fabrication, and assembly through the use of computer-aided technologies. The four technical components are “planning and controlling”, “information resources management”, “product and process definition”, and “factory automation”.

In the computer-aided technologies used in the whole manufacturing process. The first type includes material requirement planning (MRP) and manufacturing resources requirement (MRPII) for planning and controlling. The second type includes shared databases (Share DB), wide area network (WAN), and local area network (LAN) for information resources management. The third type includes computer-aided design (CAD) and computer-aided engineering (CAE) for product design and development. The last type includes numerical control/computer/direct (NC/CNC/DNC), computer-aided inspection/testing/tracking (CAI/T/T), computer-aided manufacturing like flexible manufacturing cell or systems (FMC/FMS), automated parts loading/unloading (APL/U), automated tool changes (ATC), robotics (Robot), automated storage/retrieval systems (AS/AR), and automated guided vehicles (AGV) for factory automation. The research is based on a survey in 18 countries, and researches in more than 20 countries had been conducted twice. The first time was in 1992/1993 and the second in 1997/1998. This research is based on data collected in 1988 and at the time of writing, 18 countries reported data to the project coordinator. The study found that only parts of the human resources factors are significantly related to the level of computerized integration. It was also found that the development of human resources varied from country to country. Both the integration levels and the human resources development are significantly different among the 18 countries. The country contexts provide another sources of explanation of difference in human resources development. The developing countries should learn to include not only the hardware technologies, but also human resources development. This research reveals the current status of computerized integrated manufacturing and highlights the facts that fully integrated manufacturing is still a future issue (Sun, 2001).

Card, Kramarz and Lemieux (1997) investigated the effects of computer use on the employment rates of various age and education groups. Based on their knowledge of the institutional environment of the three countries (US, Canada, France), they expected to find the greatest negative impact of IT on employment in France. Their hypothesis was that if a similar negative demand shock were to effect less-skilled workers in all three countries, the result in the US, given its labor market flexibility, should primarily be a decline in the relative wages of less-skilled workers. In France, where labor markets are relatively inflexible, the shock should largely result in a decline in the relative employment of less-skilled workers. However, the results do not seem to show this pattern. In the case of the US, results show that groups that use computers most, categorized by age and education, record an intensive increase in group-employment rates. In the case of France (female workers) and Canada, there is no significant relationship between computer use and employment. The US results are based on data extracted from the Current Population Survey (CPS) of 1979 and 1989, while Labor Force Survey (conducted in 1982 and 1989) data were used for France. The data for the Canadian sample were taken from the Survey of Work History (1981) and Labor Market Activity Survey (1998).

The implementation of a computer system requires both expertise and time from management, the lack of which in small business is well documented. Hughes et al., (1992) found that about two-thirds of respondents in their large-scale UK study of small business had introduced 'innovation' in their office and administrative systems in the past five years. The majority described these as 'computer systems'. IT was also the dominant theme of innovation in products and processes.

2.5 Company's Productivity

There are numerous studies dealing with improving productivity and quality in larger multimedia corporations. At the same time, the knowledge about productivity and quality improvements in SMEs is relatively limited. Most of the activities are being decentralized in a small/medium-size company and various production activities are to be carried out in a network of SMEs works on the basis of improving the efficiency of its own system. Thus, there is a need to integrate various functional areas of firms in a network of SMEs for improving productivity and quality. An attempt has been made to develop a strategic framework for improving the integration between various functional activities in SMEs in the light of modern technologies and conceptual insights (Gunasekaran, Okko, Martikainen & Yli-Olli, 1996).

Knowledge workers and other support activities such as computer operators, maintenance workers and draftsmen play a significant role in integrating various functional departments/firms in network of SMEs dealing with marketing, distribution, finance, design, and engineering in a network of SMEs by improving the communication between them. For example, new manufacturing concepts such as Just-In Time (JIT), Total Quality Management (TQM), and technologies like Flexible Manufacturing System (FMS), Computer-Integrated Manufacturing (CIM), and Optimised Production Technology (OPT) have a tremendous impact on the output of SMEs (Gunasekaran, et. al., 1996).

There is a number of research reports in the literature that deal with productivity and quality improvements. A study by Drucker (1991) point out the importance of knowledge workers and support services in improving productivity and quality in manufacturing organizations. The impact of product defects and its impact on productivity was examined, and found They also observed that reducing the defect level increases productivity and provides opportunities to utilize the available resources effectively. Recent changes in production methods such as JIT, ZI and TQM and technologies such as FMS, OPT and CIM have focused on improving productivity and quality of manufacturing organizations.

Rossler and Sink (1990) discussed issues of productivity and quality problems considering the recent trends in manufacturing and service environments such as automation, flexibility, computers, and multi-functional workers. In particular, they emphasized the characteristics of good measurement system such as simple and effective, flexible, adaptable, and dynamic, and their role in improving productivity and quality. Knowledge workers and support activities play a major role in integrating those functional activities. JIT supports the integration between various functional areas using the pull type production, strict schedule of production and very close supplier-purchasing relationship. For example, marketing and production must operate without disconnected objectives and strategies. If marketing needs quality products at competitive prices with a view to increase the income, then SMEs should formulate its strategies accordingly (Gunasekaran, et. at., 1996).

A case study by Gunasekaran, et. al., (1996) about improving productivity and quality in SMEs examined the purpose of the study was explain the importance of new production concepts and technologies for SMEs and how they can be used for improving the productivity and quality and facilitating suitable alliances and networking of firms for the integration of various functional areas and aligning the business and productivity and quality improvement strategies in a network of firms. The findings found that to maintain the competitive position of a firm in these changing markets, firms have to re-evaluate their strategy. Managers and entrepneurs should analyse the sector in which they operate and adopt a proper strategy. As a result of these reconsiderations, a lot of large, and also small and medium-sized enterprises, did opt for co-operation, more specifically for strategic alliances.

Huergo and Jaumandreu (2004) examined process innovation and productivity growth. Their investigation focused on the relationship between the introduction of innovations and the growth of productivity. The sample data assisted of more than 2300 firms manufacturing surveyed during the period 1990-1998. Firms with fewer than 200 workers were sampled randomly by industry and size strata, retaining 5%, while firms with more than 200 workers were all requested to participate, and the positive answers represented more or less a self-selected 60%. The investigation is mainly intended to examine whether innovations really induce growth, the life span and time pattern of these productivity effects and the presumed heterogeneity associated with different frequencies of innovations. The results found that firms that enter the market experiencing high productivity growth and above-average growth rates tend to last for many years, and that productivity growth of surviving firms converges. Process innovation clearly induces, however, extra productivity growth at any point in this process. Extra growth tends persist for a number of years, but it is followed by below-average productivity growth, very close to a half, if innovation then stops.

Atrostic and Nguyen (2002) looked at the effects of computers on productivity, particularly using information technology in firms. The sample of data on the use of computer networks and electronic business processes in the manufacturing sector of the United States were collected for the first time in 1999. Using these data, it was found that there is a strong link between labor productivity and the presence of computer networks. Average labor productivity is higher in plants with networks. Computer networks have a positive and significant effect on plant labor productivity after controlling for multiple factors of production and plant characteristics.

2.6 ICT and Technology Training

Many observers have noted that learning-in the sense of a growing understanding of how to use the technology, how to employ it and how to avoid mistakes-characterize the successful cases of implementation. There are a number of possible areas for learning through the IT adoption process (Fuller, 1996).

To improve the internal efficiency and business performance of small and medium-sized enterprises (SMEs), a number of training initiatives have been introduced in the United Kingdom over the last decade. The provision of training to SMEs has been based upon the premise that by Jennings and Banfield (1993) that training can, and should be, a powerful agent of change, facilitating and enabling a company to grow, expand and develop its capabilities, thus enhancing profitability.

Stanworth et al (1992) examined the development needs of 120 manufacturing and service SMEs in three regions in England. They monitored the impact, in terms of performance, of attending business development workshops but found no evidence that performance over the 1989-1991 period, when the workshops were taking place, was superior to that in three prior years. The problem here, however, as the authors acknowledge, is that macro-economic conditions were very different since the workshops were held in the depth of a recession in the United Kingdom.

The study by Gray (1989) based on data from a non-random postal survey of twenty-five firms in the Mezzogiorno region of Southern Italy, monitored the effectiveness of enterprise training. The study focused on measurable objective changes to business performance one year after the completion of an enterprise training course. The study concluded that the training course had been beneficial. Nearly three-quarters of firms reported an increase in sales turnover.

A study by Wynarczyk et al (1993) of fast-growth SMEs in the United Kingdom was also unable to find a link, once a variety of variables were held constant, between firm performance and the provision of training. They were, in addition, unable to find a link between salaries paid to managers in SMEs and whether those managers had received some form of training. Further, the Cambridge Small Business Center (1992) survey in the United Kingdom was unable to demonstrate a clear link between firm growth and whether or not training had been undertaken.

According to Baldwin et. al., (1994), based on responses from a large postal and telephone survey of 1, 480 growing SMEs (defined as those businesses that had grown in employment, sales and assets between 1984 and 1988) in five regions and ten industries in Canada, found that business success was not associated with training place. In fact, they concluded, labor issues played a minor role in discriminating between more successful (with regard to growth in profitability) and less successful groups of firms. Their univariate empirical analysis revealed that both the proportion of employees and the expenditure per employees on training were negatively correlated with business profitability. They also observed that the most successful business tended to train fewer workers than less successful group firms. In addition, the more successful firms were more likely to provide formal training and less likely to undertake informal training. Organizational change caused through the implementation of ICT have major impacts of enterprise employment and work. There were five major trends can be indentified: a shift in the economic activity of goods-producing industries towards service industry, an increase in the skills required for the performance of task that favor skilled work, the need for ongoing training, a polarization of wages around skill levels, and a more frequent use of typical, or non-standard, work contrast.

New technologies are progressing and circulating so fast that it is necessary for workers to constantly update their skills. The reason for this is that career jobs with single employer are becoming a rate commodity and job characteristics are changing and diversifying with the market's evolution. Employees no longer stay with a single company for their entire career. People entering the workforce today will work with different organizations and change career at least twice. In the new economy, the employer or employee employment relationship has been turned up side down. In most cases, the old employer or employee relationship, which offered security and reward to the individual in exchange for corporate royalty has to go. Instead, individuals are told to take responsibility for their own working life and career, including the responsibility of ensuring that they constantly update their skills. In exchange, a company undertakes to empower them in their work, by removing old-style supervisory practices and replacing these by new types of team working, based on performance management and provide high-quality work experience and set energizing context for social development. The old master servant basis to the employment relationship, in other words, is replaced with something more modern (Koutsoutos, 2003).

Some indication of the time needed for these complementary inputs to be developed is given by Basu et. al., (2003) who find that TFP at industry level in the US is significantly related to ICT capital growth with long lags ranging between 5-15 years. In order to make effective use of ICTs, many firms need to pass through periods of experimentation and learning, investing in the adaptation or development of software, the implementation of appropriate new modes of work organization and the development of new products and services. The development of ICT-related skills is central to this process of organizational change. Indeed, Bresnahan, Brynjofsson and Hitt (2002) suggest that organizational investments in assets which are complementary to ICTs may contribute more to raising demand for skilled labor than the diffusion of ICTs themselves.

2.7 ICT and Technology Investment

A study by Cragg, King and Hussin (2002) provides evidence that some IT investment can impact on small firm performance and IT alignment is important in understanding the relationship between IT and performance. Their study focused on measuring the alignment of business strategy and IT strategy among small UK manufacturing firms and then investigated the link between alignment and performance. Using mailed questionnaires, data from 250 firms were collected on nine strategy areas so that business and IT responses could be compared. The results indicated that a significant proportion of small firms had achieved high IT alignment and organizational performance.

In recent years, ICTs have been characterized by rapid declines in price: performance ratios which have increased their attractiveness relative to the use of non-ICT capital inputs and other inputs (such as unskilled labor) which are not complementary to the use of ICTs. In principle, ICT investments should help early-adopting firms to achieve higher levels of performance, for example, by improving the efficiency with which various tasks are carried out by different sections of the workforce or by facilitating more rapid monitoring of trends in consumer demand and improvements in communications with suppliers of key components and services. However, in line with some previous new ‘general purpose’ technologies such as electrification, the short-term impact of ICT investments on firm-level performance may be small or even negative due to the time and resources needed to develop complementary production inputs (Helpman & Trajtenberg, 1998).

2.8 ICT and Technology Benefits

There is evidence from many firm-level studies, and from many countries, that ICT use has a positive impact on firm performance. These impacts can vary, with firms showing either one or more ICT technologies had a higher level of productivity than firms that did not use technologies. There is also evidence that ICT can help firms in the competitive process. The study by Doms, Dunne and Roberts (1995) in the United States found that increases in the capital intensity of the product mix and in the use of advanced manufacturing are positively correlated with plant expansion and negatively with plant exit.

Baldwin and Sabourin (2002) found that a considerable amount of market share is transferred from declining firms to growing firms over a decade in Canada. Those technology users that were using communications technologies or that combined technologies from several different technology classes increased their relative productivity the most. In turn, gains in relative productivity were accompanied by gains in market share.

Some ICT technologies may be more important to strengthen firm performance than others. Computer networks may be particularly important, as they allow a firm to outsource certain activities, to work closer with customers and suppliers, and to better integrate activities throughout the value chain. The study by Atrostic and Nguyen (2002) in the United States directly linked computer network use (both EDI and internet) to productivity. They found that average labor productivity is higher in plants with networks and that the impact of networks is positive and significant after controlling for several production factors and plant characteristics. Similar work has been carried out for Japan. Motohashi (2001) found that the impact of direct business operation networks on productivity is much clearer than that of back office supporting systems, such as human resource management and management planning systems. Firms with networks are also found to outsource more production activities.

Lal (2004) did a case study approach to examine both direct and indirect employment associated with the adoption and production of new technologies. The study covers a wide spectrum of large firms ranging from skill intensive sectors such as garment manufacturing and E-business technology producing firms. The sample included firms that produce e-business technology as well as those use such technologies. Within the technology using firms there are two extremes of the industrial spectrum – the modern industry segment represented by consumer electronic and componentmanufacturing firms, and the traditional, labor intensive, industry represented by garment manufacturing firms. Samples were selected on the basis of their sales turnover over the past few years of the firms on the map of India. Data covering a period of nine years in 1994-1995 to 2003-2004 were used in the analysis. The results of the study did not find any evidence to support the argument that adoption of e-business technologies leads to a loss of jobs. The results do indicate, however, that the adoption of e-business technologies might result in the restructuring of business organizations. Indeed, the consumer electronics firms survey adopted these technologies more or less in all business activities such as production, marketing, coordination, supply chain management, and customer relation management. Garment manufacturing firms, on the other hand, adopted email and internet for interacting with buyers and computer-aided design (CAD) technologies in manufacturing process.

Peitchinis (1984) studied the employment effect of the introduction of computer equipment and office automation in a number of manufacturing sectors ranging from food to oil companies in Canada. The author had rejected the prediction of mass unemployment as a result of IT adoption that has generally been positive. The study is based on firm level data, but the findings apply primarily to firms that had not reached a saturation point in the demand for their products. Such firms could generate employment by increasing their production capacity and by adopting IT tools. The author observed, however, that there could be employment displacement as a result of adoption of IT in matured industries and in particular occupations. Although the sample firms covered by researchers were engaged in manufacturing of goods, the study concentrated mainly on the introduction of computer equipment in office automation.

A study by Kuwahara (1984) emphasized the positive employment-generating effects of a range of new technologies in the Japanese economy. Although these new technologies included biotechnology and aerospace, the main emphasis was on IT. Microelectronics-based technologies (technologies that are used to manufactured hardware of information systems, communication equipment, audio/visual devices, and other electronic products) and IT were seen as creating multiplier effects in other industries and services. The study presents detailed estimates of job creation effects in high technology industries and estimates categorized into various skills levels in Japan. The findings suggest that engineers are likely to be in greater demand than non-technical workers in high technology industries. At the same time, IT tools required a highly skilled workforce for the implementation and use of microelectronic-based systems (Ayres, 1991; James, 1994).

The implementation of computer-integrated manufacturing (CIM) in small and medium enterprises (Marri, Gunesekaran & Kobu, 2003) in companies provides benefits for both employers and employees. Some of the benefits include high leverage opportunities such as new technology, new products and automation, promotion, higher salaries and better standard of living. CIM systems reduce human error and stress and improve motivation, safety, knowledge, working environment, communication, teamwork, and confidence. CIM is a term used to describe the modern approach in manufacturing. The main feature of CIM is the integration of all manufacturing functions, including design, engineering, planning, control, fabrication, and assembly through the use of computer-aided technologies (Sun, 2001). Thus, the technological changes required for implementing CIM in SMEs are far-reaching and inevitable. Flexible manufacturing allows SMEs to shift from a strategy of selling products to producing to order.

Marri et. al. (2003) evoked at the implementation of computer-integrated manufacturing (CIM) in 24 conditionly selected SMEs. In the empirical study, companies were asked about achievement of CIM with flexibility. Analysis of the responses indicates that 33 per cent of companies achieved a good degree of flexibility after the implementation of CIM in their companies. Another 33 per cent of companies indicated that they reached an average degree of flexibility. The response of 26 per cent of companies is that they have achieved a high degree of flexibility with the help of CIM. A further 4 per cent of companies reported that they achieved a below average degree of flexibility. Finally, another 4 per cent of companies reported that they have not coped at all in equipment/product flexibility after the implementation of CIM. Overall, more than 50 per cent of the SMEs which have implemented CIM have achieved a high degree of product/equipment flexibility. Tangibles and intangibles as well as financial and non-financial performance of CIM in SMEs should be considered while evaluating the benefits.

2.9 Barriers of ICT and Technology Adoption

Chan, Keung and Chung (2000) found that an accepted technology or procedure is usually built behind the past success. It is counter to human nature to change from the synergy of success while it is still working. Thus, there is always a necessity for a company to continuously change its current or existing business practices to prepare for the future. Technology or work-procedure will always be part of that change and this creates problems if new technology is to be assimilated into the organization with an internally hardening structure. Yet, if there are enough motivations for change, then the organization will easily practice technology assimilation as a new change and accept it with little resistance. It is proposed that creating a new source of knowledge would be enough to motivate an organization to change and as a result, the change would instigate the organization for a new technology/procedure. The new source of knowledge would be in a form of tacit knowledge embedded in the unidentified efficiency, capability or effectiveness. By just looking at the business operations of an SME, it is very difficult to identify any improvement opportunities, hence, there is a need to construct a tool that could resolve such difficulties. In addition, the design and implementation of such tools should consider many factors in order to increase its effectiveness.

The barriers of ICT and technology adoption was determined during implementation stage (Chan, et. al., 2000). It is found that no obvious human resistance is reflected upon the ABC as workers treated it as another routine job. Frontline workers participating in the process were not asked to act independently, their of handling such a system tool. Since the tacit knowledge is embedded into the exiting accepted procedure and it is not easy to be realized by front-line employees, the tools must be designed for collaboration with those who use it. With the academic collaboration in place, much of the planning work is shifted away from the company to the academic, leaving more resources for the company to deal with other problem areas. Perhaps the largest impact of this simple exercise is that it has shown to management that there is a different between ABC and traditional costing. Before the introduction of ABC, management would have to believe that the existing costing method was appropriate an by using the new data obtained from the ABC system, management has proposed a new scheme based on the data collected from this system.

2.10 Summary

In line with the 9th Malaysia Plan (2006-2010), it was reported that investment from the technology and ICT Sector is expected to be the main driver for the manufacturing sector ‘s overall growth which in turn could contribute to greater export and create more employment opportunities. The sector is expected to grow by an average of 6.75% annuals during the MP up from 4.1% in the 8MP. The higher growth rate is projected to boost the share distribution of the manufacturing sector is GDP to 31.8% from 30.8% during 8MP. The 9MP efforts for the manufacturing factor will focus on the development of large science and innovation based activities , especially biotechnology and ICT industries to diversify the manufacturing base.

Research outcomes reported upon in this project could help the development of a road map to be used by manufacturing firms to better diffuse technology and ICT barriers. Therefore, these issues should be studied in more details through identifying drivers and inhibitors of ICT innovations.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed in the study. It introduces the population and the sample of the study, than geographical distribution, and the data-gathering instrument.

3.2 The Population of the Study

The population of firms is approximates 20, 204 of which 76.0% are small, 17.0% are medium and 6.2% are large. The size of the firms chosen was based on the definition of small and medium industries as suggested by the Ministry of International Trade and Industry (PIKS Secretariat, Penang, 1994) that specifies a firm with full-time employees of not exceeding 150 (see Table 3.1). Sampling technique in the form of proportionate random sampling was used by taking into account the different sample frame sizes according to the industries (Kerlinger and Lee, 2000).

Table 3.1: Classification of Small and Medium Scale Industry (SMI) for the manufacturing sector in Malaysia

Criteria	Category of SMIs	
	Small Industry	**Medium Industry**
Employee	< 49 person	50 – 199 person
Sale	< RM 3 million	RM 3 million – RM 10 million
Net Asset	< RM 1 million	RM 1 million – RM 5 million
Capital	< RM 0.5 million	RM 0.5 million – RM 2.5 million
Local Equity	< 50 %	> 51 %

Source: PIKS (1994)

The categories as shown in Table 3.2 and Table 3.3 are further classified into States that are developed, developing, and less developed. The population size of SMEs in this study is 703 to coverage companies for SMIs in respectively.

Table 3.2: Classification of Large Companies for the Manufacturing Sector in Malaysia

Developed States	Number	Developing States	Number	Less Developed States	Number
Selangor	187	N. Sembilan	38	Kelantan	5
W. Persekutuan	127	Malacca	40	K.Terengganu	4
Johor	70	Perak	47	Kedah	27
Penang	108	Pahang	16	Perlis	4
				Sabah	14
				Sarawak	16
SUB-TOTAL	**492**	**SUB-TOTAL**	**141**	**SUB-TOTAL**	**70**
GRAND TOTAL	**703**				

Source: FMM (2002)

Table 3.3: Classification of SMIs in Malaysia

Developed States	Number	Developing States	Number	Less Developed States	Number
Selangor	707	N. Sembilan	39	Kelantan	18
W. Persekutuan	102	Malacca	49	K.Terengganu	4
Johor	150	Perak	139	Kedah	76
Penang	171	Pahang	23	Perlis	1
				Sabah	30
				Sarawak	26
SUB-TOTAL	**1,200**	**SUB-TOTAL**	**250**	**SUB-TOTAL**	**191**
GRAND TOTAL	**1641**				

Source: SMIDEC (2003)

3.3 Construction of Instrument

A questionnaire was developed by the researcher based on literature review and formal interviews with companies' officers (such as HR managers) to get an overview about ICT and technology adoption. The questionnaire is divided into five (5) parts, including the following:

3.3.1 Part A: Background of the Company

This part covers information about the company's location, status, ownership, size of the employee, position level, and requirement of skill worker in technology and ICT, and number of workforce.

3.3.2 Part B: Information and Communication Technology (ICT) Adoption

This section is divided into two parts, namely, Administration and Operations. It requests respondents to disclose information on the extent of their ICT adoption through the use or non-use of automation in the workplace.

3.3.3 Part C: Technology Adoption

Divided into three parts (Stand-alone Technology, Intermediate Technology, and Integrated Technology), this section seeks information on how the company utilizes certain forms of technology, like engineering technology and design, machine technology, fabric and assembling, material control technology, and inspection and testing equipment.

3.3.4 Part D: Training Programs

This part consists of three parts: Skilled Training, ICT Training, and Operations Technology Training. As the name of the section implies, this portion of the questionnaire seeks data on the types of administrative and operational training programs undertaken by the company. It also seeks to obtain information on how ICT is being used by the employees in their work routines.

3.3.5 Part E: Measurement of Company's Productivity

This part describes the relationship of the company's productivity based on production as well as non-production (e.g., service) after the adoption of technology and ICT.

3.4 Data Collection

Table 3.4 shown the number of respondent that participated in the present study grouped by state.

Table 3.4: Classification of SMIs in Malaysia with the actual study

Developed States	Number	Developing States	Number	Less Developed States	Number
Selangor	23	N. Sembilan	1	Kelantan	5
W. Persekutuan	7	Malacca	6	K.Terengganu	5
Johor	9	Perak	16	Kedah	18
Penang	23	Pahang	3	Perlis	3
				Sarawak	1
SUB-TOTAL	**62**	**SUB-TOTAL**	**26**	**SUB-TOTAL**	**32**
GRAND TOTAL	**120**				

3.4.1 MSC and Non MSC Status of Firms

Most of the respondents (n = 72) were from non-MSC companies, with a number of them from Perak (n = 15) and Selangor (n = 13). Nine were non-MSC companies, distributed in the States of Selangor (n = 3), Penang (n = 2), and one each from Johor, Kedah, Kuala Terengganu, and Wilayah Persekutuan. Thirty-nine respondents did not disclose their company status. Table 3.5 summarizes the data.

Table 3.5:
Distribution of respondents by state and company status

State	**MSC**	**Non-MSC**
Johor	1	5
Kedah	1	6
Kelantan	-	4
Melaka	-	5
N.Sembilan	-	1
Pahang	-	3
Penang	2	7
Perak	-	15
Perlis	-	3
Selangor	3	13
Terengganu	1	4
W.Persekutuan	1	6
Sub-Total	**9**	**72**
No Answer	**39**	
Grand Total	**81**	

3.4.2 Size of the Company

In terms of size, this research obtained a good proportion of small (n = 46) and large (n = 45) companies, with 29 medium-sized companies that also participated. Of the small companies, the highest number of respondents were Selangor (n = 11), while Negeri Sembilan and Pahang were not represented. Selangor (n = 11) also had the highest number of respondents among medium-sized companies, while nobody responded from Kelantan, Pahang, Sarawak, and Kuala Terengganu. Among large companies, 15 were from Penang, while none came from Negeri Sembilan, Perlis, and Sarawak. Table 3.6 shows the data.

Table 3.6:
Distribution of respondents by state and size of employees

State	Size of Employee		
	Small (49)	**Medium (50-99)**	**Large (200)**
Johor	3	4	2
Kedah	5	3	10
Kelantan	4	-	1
Melaka	2	2	2
N.Sembilan	-	1	-
Pahang	-	-	3
Penang	4	4	15
Perak	8	2	6
Perlis	2	1	-
Sarawak	1	-	-
Selangor	11	11	1
Terengganu	3	-	2
W.Persekutuan	3	1	3
Sub-Total	**46**	**29**	**45**
Grand Total	**120**		

3.4.3 Type of Ownership

With regard to type of ownership, 69 out of 120 who participated in the study were 100% Malaysian-owned. A number of them (n = 28) were also foreign-owned, and a few others (n = 23) government-owned. Of the wholly Malaysian-owned companies, the highest number of respondents were from Selangor (n = 21), while none was from Negeri Sembilan. Selangor (n = 11) also posted the highest number of respondents among foreign-owned companies, while Kelantan, Pahang, Sarawak, and Terengganu had no respondents from such companies. Among government companies, Penang (n = 15) posted the highest participation, with none from Negeri Sembilan, Perlis, and Sarawak. The data are shown in Table 3.7.

Table 3.7:
Distribution of respondents by types of ownership

State	**Types of Ownership**		
	100% Malaysian owned	**Foreign-owned company**	**Government**
Johor	5	4	2
Kedah	8	3	10
Kelantan	1	-	1
Melaka	3	2	2
N.Sembilan	-	1	-
Pahang	1	-	3
Penang	11	4	15
Perak	8	2	6
Perlis	2	1	-
Sarawak	1	-	-
Selangor	21	11	1
Terengganu	3	-	2
W.Persekutuan	5	1	3
Sub-Total	**69**	**28**	**23**
Grand Total	**120**		

3.4.4 Company Location (West Coast)

A total of 102 companies in the west coast participated in this research. Most of them were large companies (n = 38) operating in either Penang (n = 15) or Kedah (n = 10). A number of small companies (n = 36) also took part in this study, with many of them in Selangor (n = 11) and Perak (n = 8). Twenty-eight medium-sized companies also responded to the survey, most of which were from Selangor (n = 11). Table 3.8 shows the data.

Table 3.8:
Distribution of respondents by categories of employees in west coast

State	Size of Employee		
	Small (49)	**Medium (50-99)**	**Large (200)**
Johor	3	4	2
Melaka	2	2	2
Penang	4	4	15
W.Persekutuan	3	1	3
Kedah	5	3	10
N.Sembilan	-	1	-
Perak	8	2	6
Selangor	11	11	-
Sub-Total	**36**	**28**	**38**
Grand Total	**102**		

3.4.5 Company Location (East Coast)

In the east coast, only 18 companies were involved in this research. Of this number, 10 were small companies (n = 10), seven were large, and one medium-sized. The data are summarized in Table 3.9.

Table 3.9:
Show the east coast by categories of employees

State	Size of Employee		
	Small (49)	**Medium (50-99)**	**Large (200)**
Sarawak	1	-	1
Kelantan	4	-	1
Pahang	-	-	3
Perlis	2	1	-
Terengganu	3	-	2
Sub-Total	**10**	**1**	**7**
Grand Total	**18**		

CHAPTER FOUR
PILOT STUDY

4.1 Introduction

A total of 200 firms were selected for the study. Questionnaires with self-address stamped envelopes were sent to the selected firms based on the FMM list together with a cover letter describing the aims of the study and instructions on filling the questionnaire. A supporting letter from the Ministry of Science Technology and Environment (MOSTE) was also enclosed to support the study and to encourage better response. Initially, a total of 200 questionnaires were sent to target companies throughout Malaysia and a total of 31 questionnaires (15 percent) were returned. These questionnaires were completely answered. Hence, a total of 31 (15 percent) completed questionnaires were used for reliability testing. The 15% rate of return was considered acceptable as it falls within the typical response reported by other studies involving SMEs which was between 10% to 20% (Palvia et al., 1994; Lai, 1994; Raymond & Bergeron, 1992). The reliability test score is 0.96.

4.2 Findings

Table 4.1 and Fig. 4.1 present the ownership status and distribution of the firm's demography. The results show that almost three-quarter of the sample firms are Malaysian owned with 41.9% fully Malaysian and 16.1% owned majority by Malaysian.

The remaining 41.9% of the sample is foreign owned with more than 50% local equity. In terms of location, half of the sample is located in Penang 35.5%, and Kedah 32.3%. The remaining 22.6% in Selangor, 6.5% in Johor and 3.2% in Sarawak. Penang is an industrial state with high concentration of industries particularly in Prai and same in Kedah a new industrial area has been developed in Kulim.

Together, both these areas formed the majority of the sample firms in this study with 71.5% respondents. In terms of the firms' size, more than 61.3% of the sample firms employ above 200 employees. The medium sample between from 50 to 199 employees is 25.8%. All small firms with less than 49 employees by 12.9%.

Table 4.1:
Distribution of the Firms' Background Information

	Frequency	%	Cum. %
I. Ownership			
Fully Malaysian	13	41.9	41.9
Malaysian owned (> 51% local)	5	16.1	58.1
Foreign owned (< 50% local)	13	41.9	100.0
II. Location			
Johor	2	6.5	6.5
Kedah	10	32.3	38.7
Pulau Pinang	11	35.5	74.2
Sarawak	1	3.2	77.4
Selangor	7	22.6	100.0
III. Number of Employees			
Less than 49	4	12.9	12.9
50 to 199	8	25.8	38.7
Above 200	19	61.3	100.0

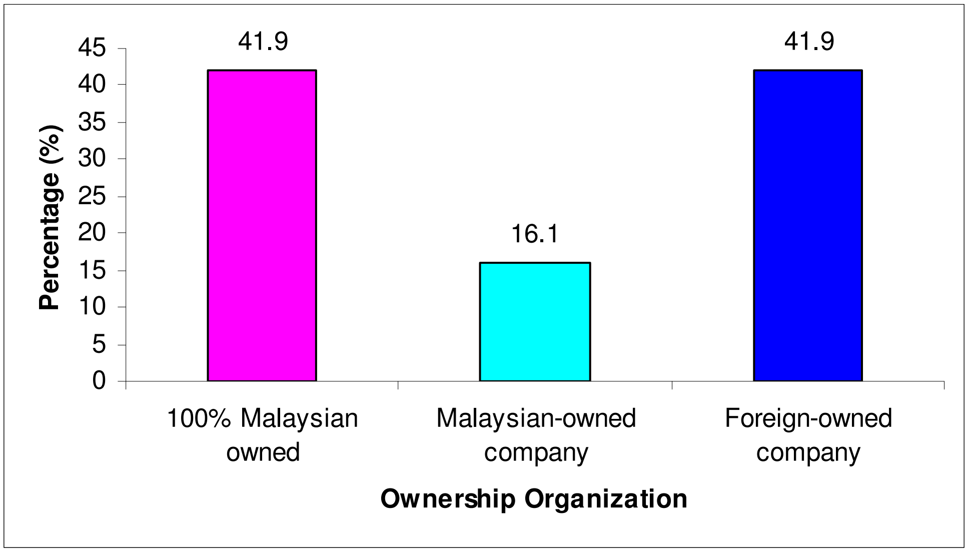

Figure 4.1: Types of ownership

Fig. 4.2 shows the manpower requirements of the sample firms categorized according to technological skill and ICT skill. Manpower requirement at the technological skill and ICT skill level showed high percentages of current fulfillment of manpower is about 77.4% and 69.0%. This may suggest that the SMEs in the sample currently have almost fulfilled their manpower requirements in terms of filling the job vacancies across all levels of the firm.

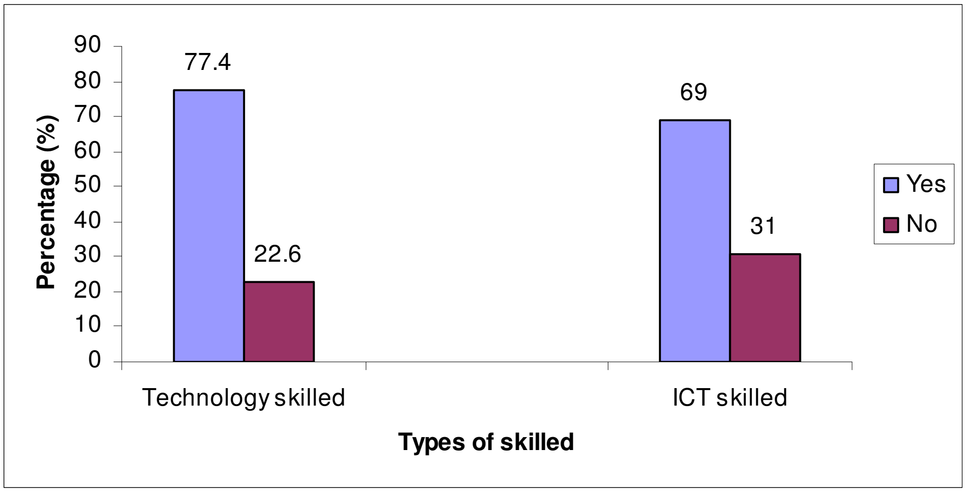

Figure 4.2: Technology skill and ICT skilled workers

Fig. 4.3 shows the percentages of the sample SMEs have k-workers, that is employees with the necessary technology skills ad ICT skills and using the IT products in carrying out their job functions. From this, the technology skilled having is 50% for the 10 and below more than by ICT skilled with 22.2%. For the range 51 and above is very low the k-workers performance necessary technology skills and ICT skills by 25% and 22.2%.

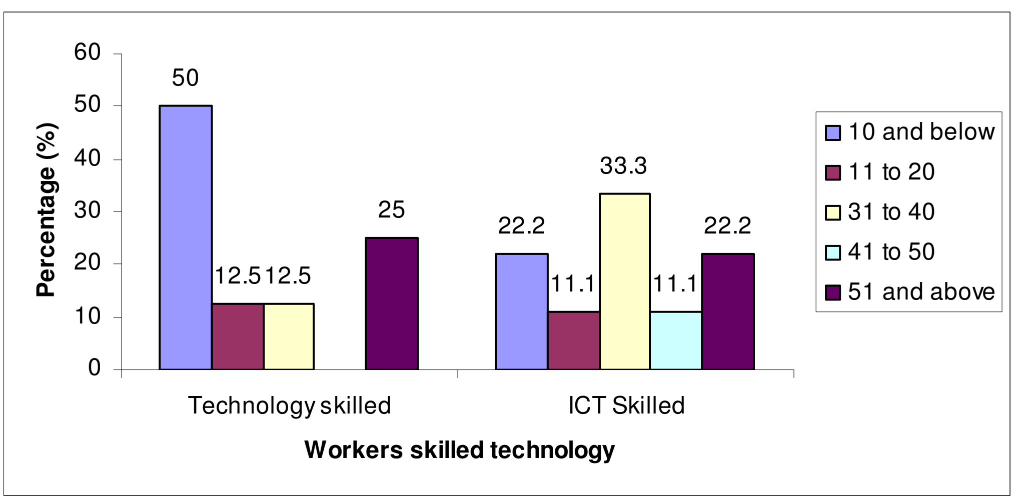

Figure 4.3: The percentages of required technology skilled and ICT skilled

In 2004, the approximate number of workforce at the managerial level in terms of top level management showed around 5 and below (44.8%) manpower in the company for the current fulfillment, however greater job demands are expected in the future in all three managerial, perhaps due to anticipation of high staff turnover and company expansion due to the recent economic recovery. This result is exhibited in Fig. 4.4, 4.5 and 4.6.

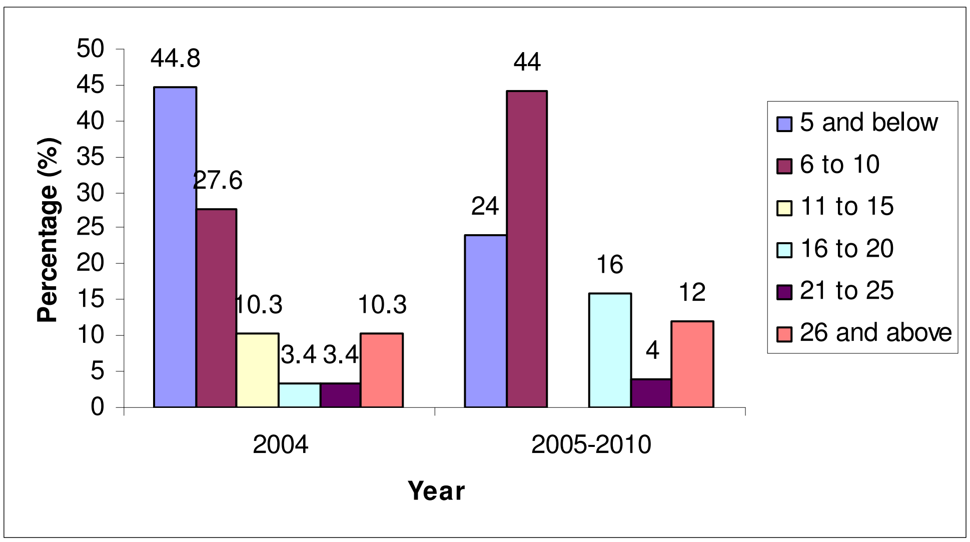

Figure 4.4: The approximate numbers of workforce at top level management in 2004 to 2005-2010 years

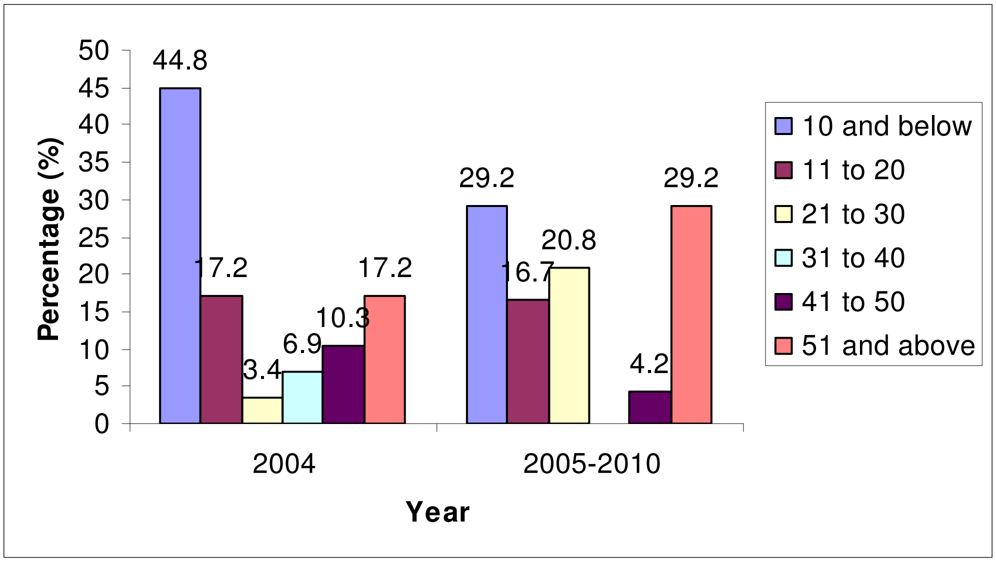

Figure 4.5: The approximate numbers of workforces at the middle level management in 2004 to 2005-2010 years

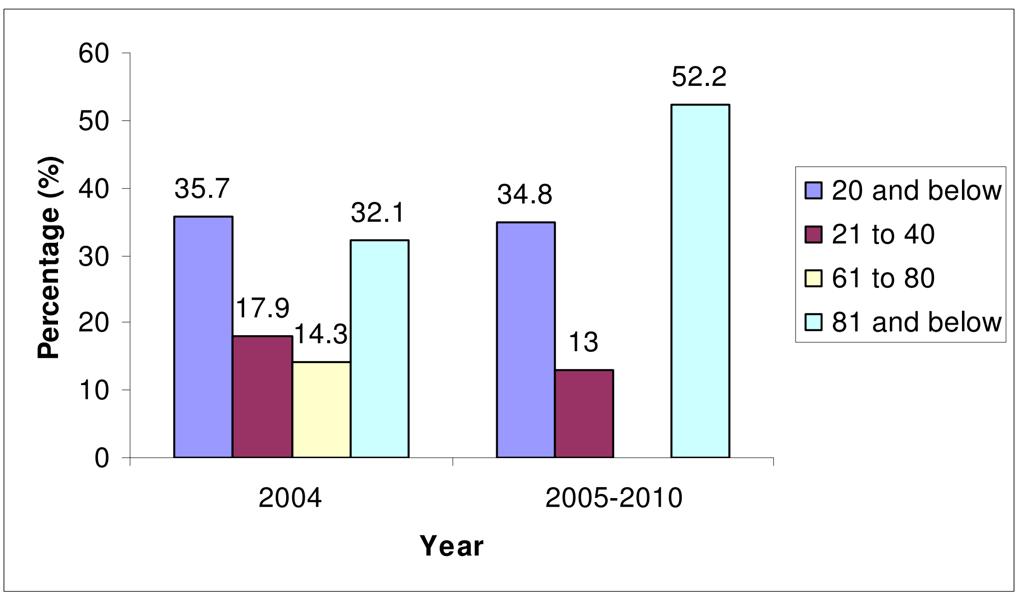

Figure 4.6: The approximate numbers of workforce at the operation management in 2004 to 2005-2010 years

The results on technological skill suggests requirements for all categories skilled and unskilled workers are currently almost being fulfilled. However, the future may see an increase in the demand for skilled and unskilled workers as the percentages of manpower requirement for technological skills decrease. This is even worse in the skilled and semi skilled categories which may suggest higher staff turnover among these categories as anticipated by the respondents. In term of ICT skill there is an overall shortage of ICT manpower requirements across all categories of ICT professionals as shown in Fig. 4.7, 4.8 and 4.9.

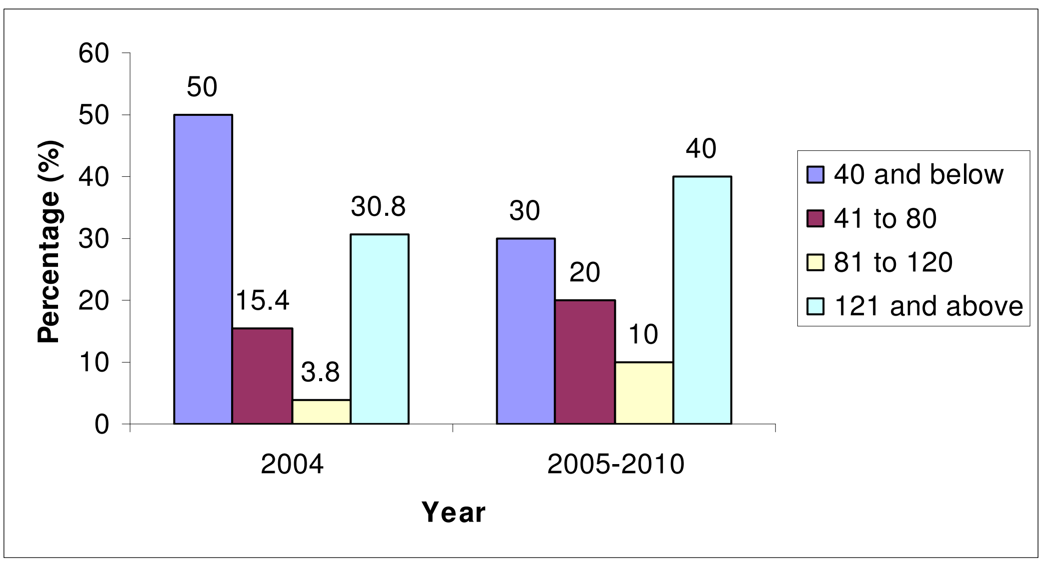

Figure 4.7: The approximate numbers of skilled workforce with fully automation in 2004 to 2005-2010 years

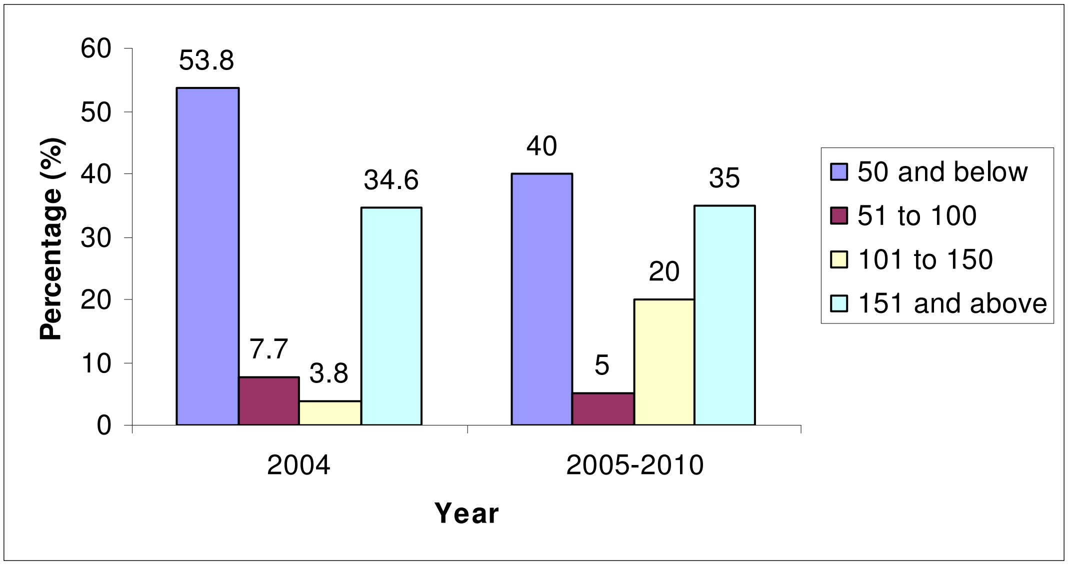

Figure 4.8: The approximate numbers of semi-skilled workforce with semi-automation in 2004 to 2005-2010 year

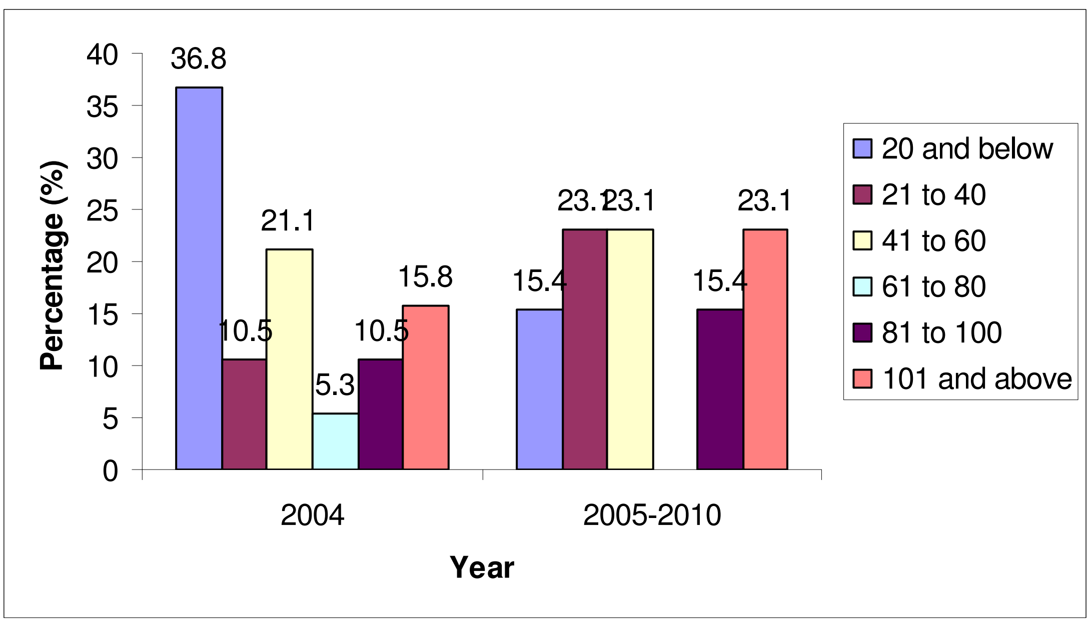

Figure 4.9: The approximate numbers of unskilled workforce with fully manual in 2004 to 2005-2010 years

The least numbers of employees are desktop publishing specialist with only 41.7% meeting below the current manpower requirement. Computer Support Specialist is next with only 50% fulfilling the current demand. This is followed by Computer Engineer at 52.6%, System Analyst (42.9%) and Database Administration (46.7%). Similarly the shortage of ICT manpower in the future is anticipated to remain with only slight increase in the shortage. This results are exhibited in Fig. 4.10, 4.11, 4.12, 4.13 and 4.14.

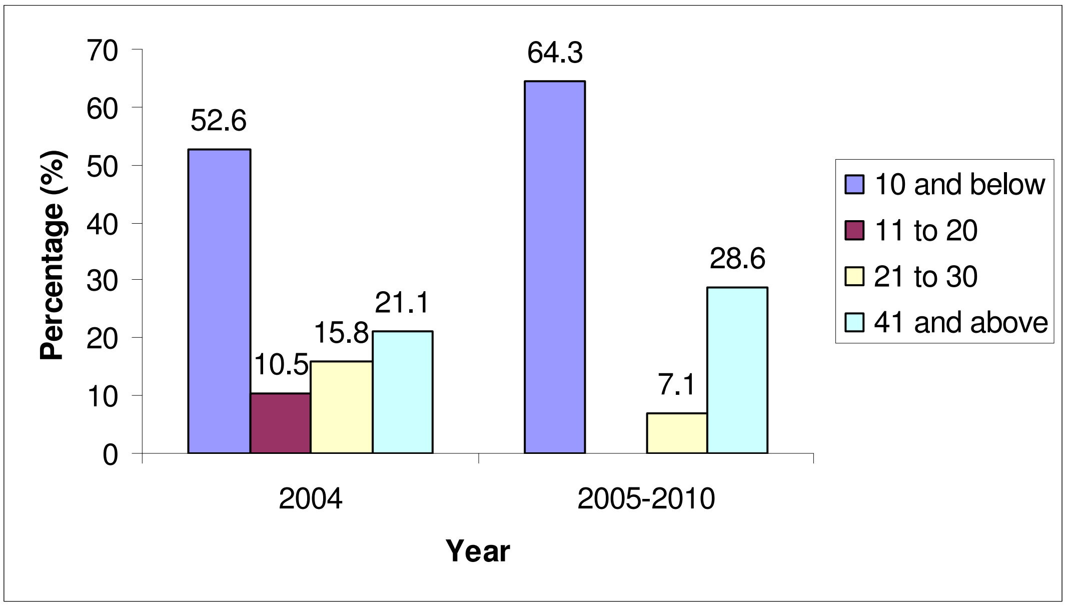

Figure 4.10: The approximate numbers of computer engineers in 2004 to 2005-2010 years

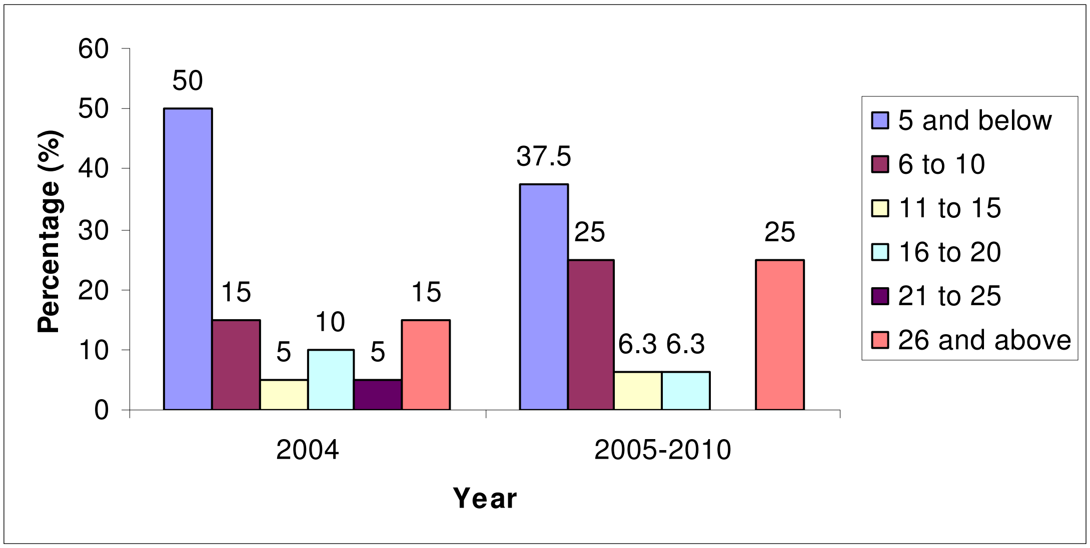

Figure 4.11: The approximate numbers of computer support specialists in 2004 to 2005-2010 years

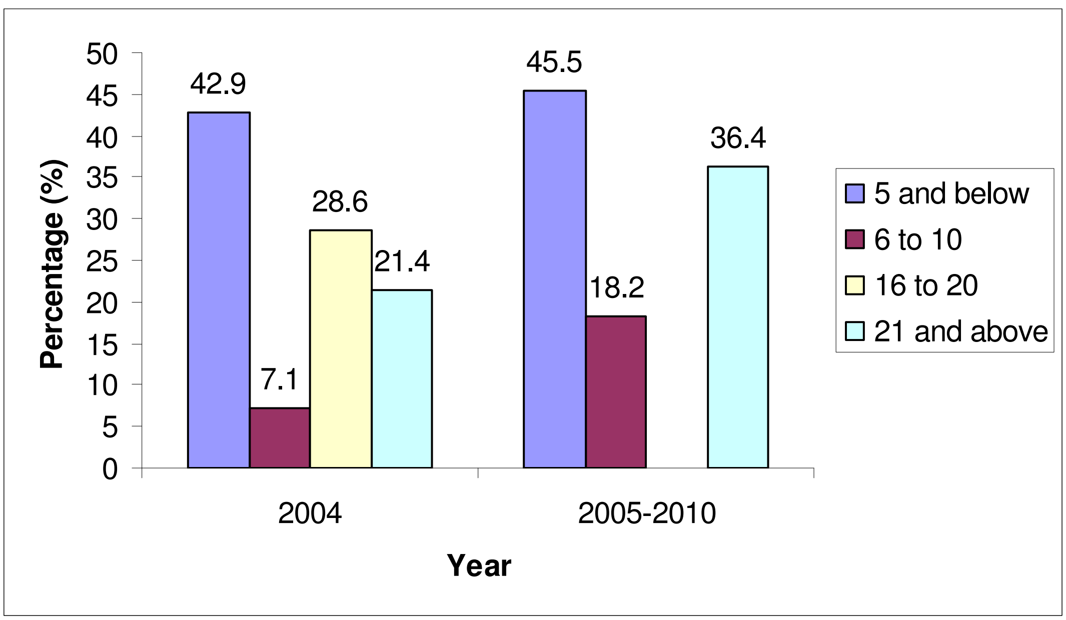

Figure 4.12: The approximate numbers of system analysts in 2004 to 2005-2010 years

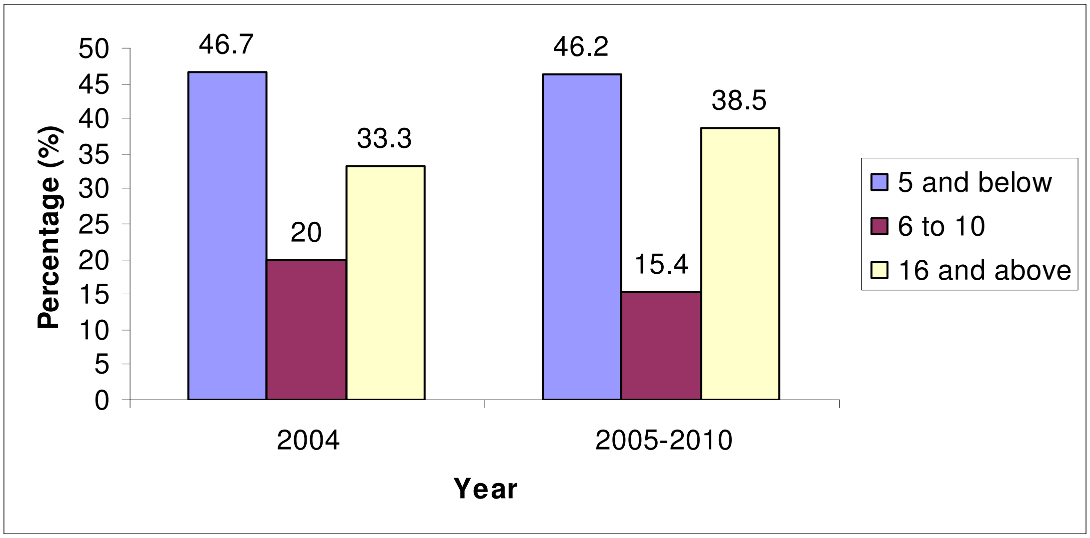

Figure 4.13: The approximate numbers of database administrators in 2004 to 2005-2010 years

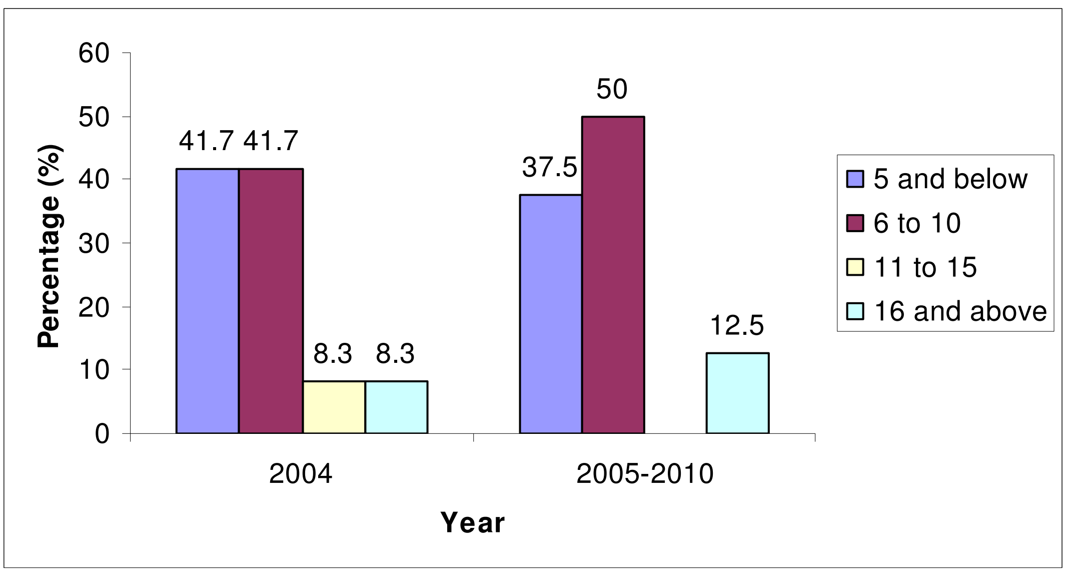

Figure 4.14: The approximate numbers of desktop publishing specialists in 2004 to 2005-2010 years

The number for non - ICT officers suggested that those who used computer in daily operation in 2004 is about 42.9% of the current fulfillment for the number workforce between 20 and below. However, the future demand for non -ICT officers in the same cluster workforce decreases to 37.5% drop from 42.9%. The finding is exhibited in Fig. 4.15.

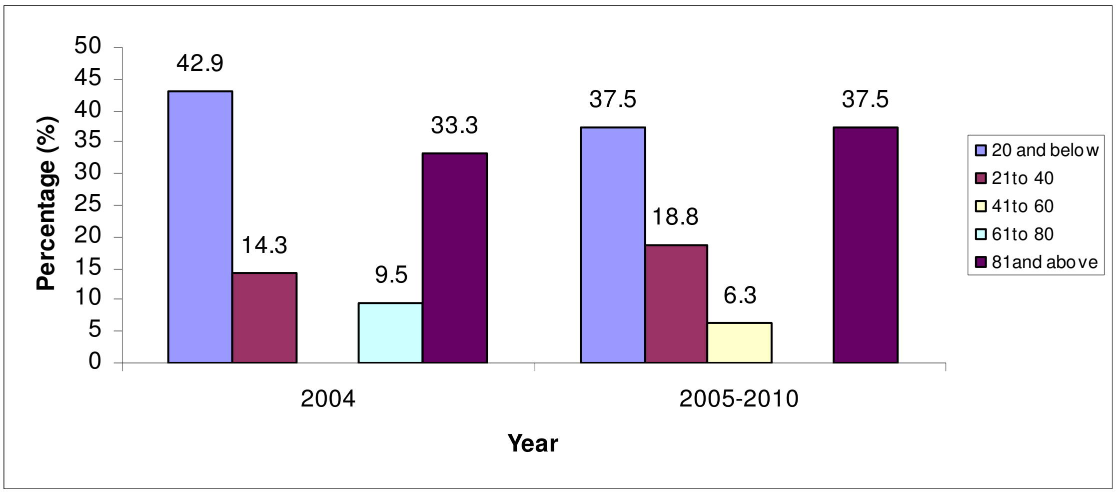

Figure 4.15: The approximate numbers of non -ICT officer using computers in daily operations in 2004 to 2005-2010 years

4.3 Discussion and Conclusion

The development of human resource is to ensure contribution to sustainable productivity for continued economic growth. In line with that, this study provides an assessment of the development of human resource based on the application of information technology in the industrial sector, specifically in the small-medium manufacturing enterprises in Malaysia. The study suggested that the awareness by the industrial sector in adopting ICT and other advanced technology is important in order to generate higher value-added economy. This study has shown a large vacuum exists for well-educated skilled manpower in the areas of IT and other high technology in the SMEs' industrial sector. The findings may not be favorable in today's era of k-economy where the need for progress in high technology development and IT is in high demand in order to facilitate globalization. The findings reveal a low level of IT manpower and a low technology adoption among the SMEs. The requirements for skilled human resource in ICT and other technologies skilled level have shown high percentages of fulfillment of manpower requirements (see Fig. 4.2). The k-workers, employees with technology and ICT skills, adopted IT products in carrying out their job functions. The percentage of K-Workers with technology skilled were found higher when compared with ICT skilled (see Fig. 4.3).

The numbers of k-workforce at the managerial level at top level managements found fulfilled the requirement. However greater job demands are expected in the future for all three managerial levels and an anticipation of high staff turnover as other companies expanded their operations as a result of recent economic recovery (see Fig. 4.4, 4.5 and 4.6). The results of the study on technological skilled suggests the current need for all categories of skilled and unskilled workers are almost being fulfilled. However, the future may see an increase in the demand for skilled and unskilled workers (see Fig. 4.7, 4.8 and 4.9).

In addition, based on the results from the pilot study it is suggested that the relevant training programs should be given to the relevant employees and firms should also be encouraged to support re-training to address the issues of trainees not being adequately trained. In addition, firms should consider introducing incentives to encourage more ICT literate employees and likewise, the government may consider giving subsidy in terms of tax incentives on training programs to encourage SMEs to invest in training.

With the current capability of technology and ICT, further research and development works should be carried out to determine the best usage of technology and ICT to help facilitate training, either through computer-assisted learning and instruction, e-learning and/or using virtual reality and other modelling and prototype development.

CHAPTER FIVE

DESCRIPTIVE ANALYSIS

5.1 Introduction

This chapter describes the findings from the survey by presenting descriptive statistics based on responses from the questionnaire instrument. The first part presents the general findings describing the background of the sampled companies. This includes the distribution of respondents according to States in Malaysia, the number of MSC status companies in the sample, types of ownership, size of the companies, and basic information on the respondents. The next part analyses the workforce situation by examining the availability of skilled workers in ICT and technology, categories of workforces for ICT and technology, levels of ICT and technology adoption, training requirements for ICT and technology.

Table 5.1 shows the distribution of respondents according to the States in Malaysia. As can be seen, all States are included with the exception of Sabah, and only one respondent each coming from the States of Sarawak and Negeri Sembilan. The highest percentage of respondents in the sample came from the states of Penang and Selangor each with 19.2 per cent of the total sample size of 120. Next came Kedah with 15 per cent and this is followed by Perak (13.3 per cent). Smaller samples came from the state of Johore (7.5 per cent), Federal Territory Kuala Lumpur (5.8 per cent), states of

Melaka (5 per cent), Kelantan (4.2 per cent), Trengganu (4.2 per cent), and Pahang and Perlis each at 2.5 per cent.

Table 5.1:
Distribution of sample respondents according to States.

No.	State	Frequency	Percent
1.	Penang	23	19.2
2.	Selangor	23	19.2
3.	Kedah	18	15.0
4.	Perak	16	13.3
5.	Johore	9	7.5
6.	Kuala Lumpur	7	5.8
7.	Melaka	6	5.0
8.	Kelantan	5	4.2
9.	Terengganu	5	4.2
10.	Pahang	3	2.5
11.	Perlis	3	2.5
12.	Sarawak	1	0.8
13.	Negeri Sembilan	1	0.8
	Total	**120**	**100 %**

Distribution of the sample by region shows that the majority of the sample respondents came from the Central Region with 38.33 per cent. This is followed closely by the Northern Region with 36.67 per cent. The Southern Region and East Coast are less represented with each account for 13.33 per cent and 10.83 per cent, respectively. Table 5.2 shows the distribution of the sample respondents by region.

Table 5.2:
Distribution of Sample by Region

Region	States	Frequency	Percentage
Northern Region	Perlis Kedah Penang **Total:**	3 18 23 44	 36.67
Central Region	Perak Selangor Kuala Lumpur **Total:**	16 23 7 46	 38.33
Southern Region	Negeri Sembilan Melacca Johore **Total:**	1 6 9 16	 13.33
East Coast Region	Pahang Trengganu Kelantan **Total:**	3 5 5 13	 10.83
East Malaysia	Sabah Sarawak **Total:**	0 1 1	 0.83
	TOTAL	120	100.00

The distribution of the sample may suggest the high concentration of the ICT industry and high technology industry in the central and northern regions of Malaysia. This is particularly true with the development of industrial and high-technology parks and free trade zone areas in the Klang Valley areas situated in the Central Region, and the Bayan Lepas Free Trade Zone, Prai Industrial area, and the Kulim High Technology Park in the Northern Region. The sample therefore appears to be proportionate to the distribution of the industry targeted for this study and findings from this report may well represent the technology and ICT industry in Malaysia.

The survey also examined the number of MSC status companies in order to have a feel of companies involved in the Multimedia Super Corridor initiative driven by the government of Malaysia. However, only a small percentage (10 per cent) of the sample has indicated that their companies attained the MSC status. A closer look at these companies shows that they are all located in Cyberjaya, Selangor. Fig. 5.1 shows the percentage distribution of MSC and non-MSC status companies in the sample. Note that 100 companies out of the 120 sample size have responded to this question.

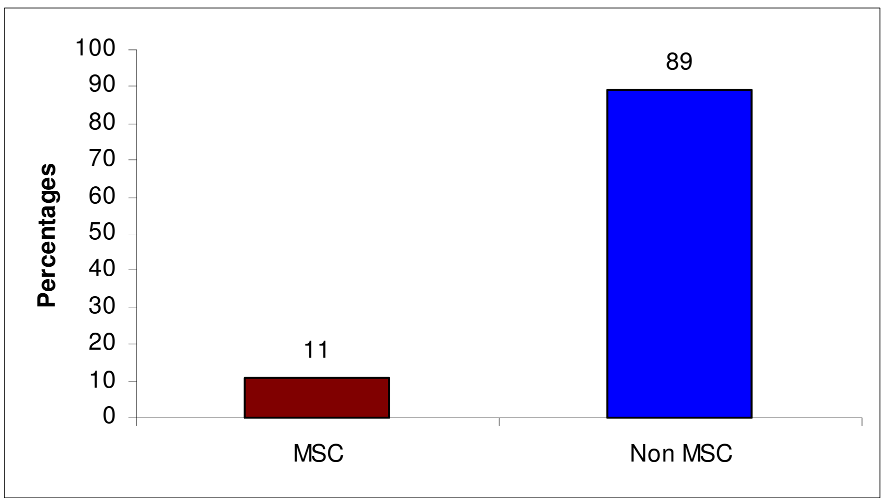

Figure 5.1: Distribution of MSC and non-MSC status in companies

In terms of ownership of companies, majority of the companies in the sample are Malaysian and locally owned accounting for 58.3 per cent. Foreign owned companies account for 22.5 per cent of the sample, leaving the remaining 19.2 per cent from the government sector. It will be interesting to make comparisons on the human resource development for both technology and ICT usage between these three major sectors as presented later in this report. Fig. 5.2 shows the ownership distribution of companies in the sample.

General background of the responding companies participated in the survey will not be complete without examining the size of the companies in terms of the number of employees. Table 5.3 shows the distribution of the companies in the sample by category, that is, small, medium and large. The table shows that small companies in the survey with employee size of less than 50 accounts for 38.3 per cent of the sample. Medium sized companies with 50 to 199 employees made up 24.2 per cent of the sample. Large

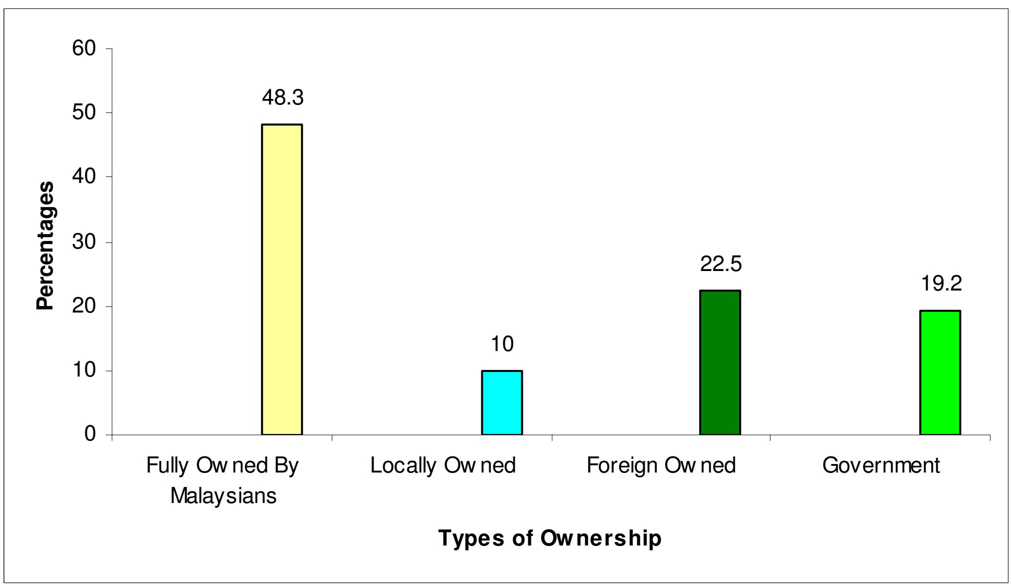

Figure 5.2: Ownership of companies

companies of 200 and above employees constitute the remaining sample amounting to 37.5 per cent. From the sample it can be seen that majority of the respondents belonged to the small and medium enterprises (SMEs) accounting for 62.5 per cent of the sample.

Table 5.3:
Category of Company by Size of Employee

Category	**Size of Employee**	**Frequency**	**Percent**
Small	49 and below	46	38.3
Medium	50-199	29	24.2
Large	200 and above	45	37.5
	Total	**120**	**100%**

Information on the respondent representing the company forms part of the general background information. The study explicitly requested those who are responsible for the technology or ICT to fill up the questionnaire. Fig. 5.3 shows the distribution of the respondent's position in the company. About 38 percent of the respondents indicated they

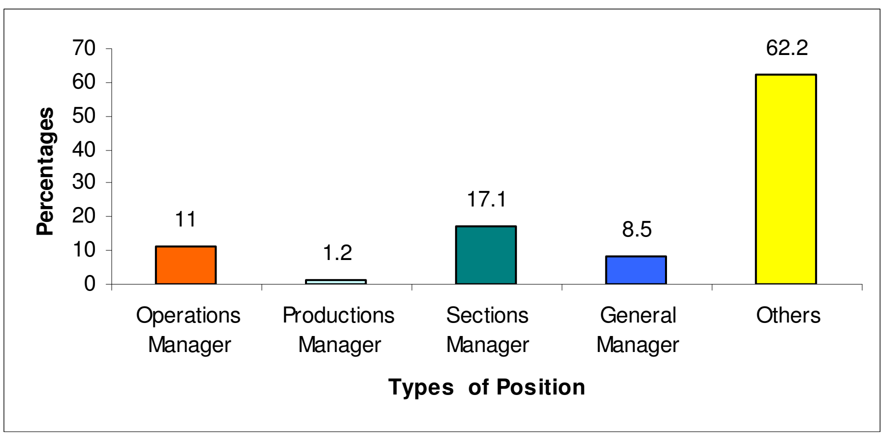

Figure 5.3: Position of respondent in the company

are in the managerial position either as a general manager, operations manager, sections manager or productions manager. Majority of the respondents (62.2 per cent) however did not indicate their position in the questionnaire.

The next section of the survey analyzes availability of skilled workers for the technology and/or ICT adoption in the company.

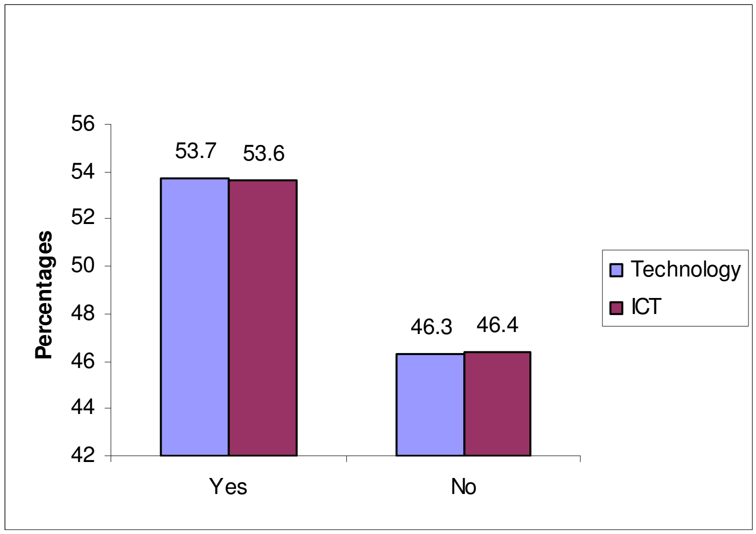

Figure 5.4: Availability of skilled workers in technology and ICT adoption

As can be seen from Fig. 5.4, more than half of the sample indicated having skilled workers in both technology and ICT with both categories have about the same proportion. Though this may look encouraging, quite a significant proportion (46 per cent) of respondents indicated they did not have adequate skilled workers in both technology and ICT. Considering the majority of the sample respondents came from the industrial areas, this finding is quite disturbing as significant number of organizations within the industry are still finding it difficult to fill up positions that requires skills and expertise. A closer look at the distribution of skilled workers shows that for the technology industry, slightly above 30 per cent have 10 or less skilled workers. Twenty-three per cent of the technology sample indicated having more than 50 skilled workers, and about 45 per cent have skilled workers in the range 10 to 50. For the ICT category, 25.5 per cent have less than 10 skilled IT workers, and the same proportion indicated having more than 50 skilled workers. The remaining half of the sample of ICT category has between 10 to 50 skilled workers. Fig. 5.5 shows the distribution of the technology and ICT samples according to the range of skilled workers available.

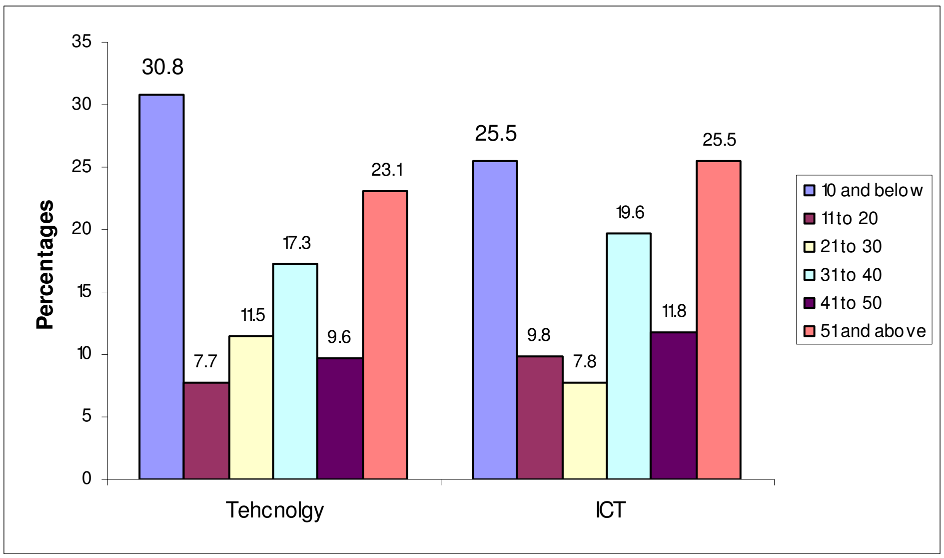

Figure 5.5: Technology and ICT industry with enough skilled workers

Fig. 5.6 shows the distribution of management workforce according to the different management levels. The questionnaire also examined the current workforce based on the 2004 figure and the anticipated demands for each management levels in the next 5 years from 2005 to 2010.

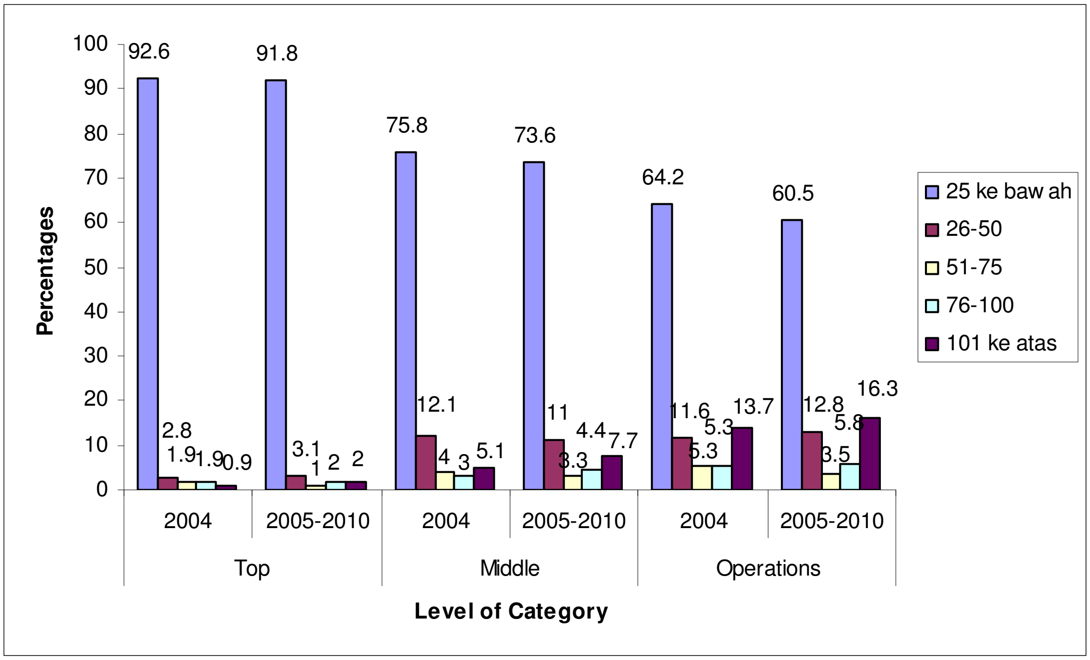

Figure 5.6: Distribution of workforce by management category

The result shows that majority of the companies have 25 or less employees in all the management level categories, ranging from as low as 64.2 per cent at the operations level to 75.8 per cent at the middle level management and increased to 92.6 per cent at the top management level in the current situation. This trend seems to be consistent even for the next 5 years as the figures indicated, though there is a slight decrease in the demand for management workforce across all three management levels. However the decrease is only slight particularly at the top level management. This may suggest that the respondents believe that there will not be any increase in the demand for workforce in the next 5 years in companies with 25 or less employees across all management levels. However, for bigger sized companies, the trend appears to be the opposite, where there seems to be an increase in management workforce demand for the next 5 years across all 3 management levels with the operations level showing the highest increase as shown in

Fig. 5.6. This may indicate larger companies are expected to have more job openings for all management categories particularly at the operations level in the technology and ICT industry in Malaysia within the next 5 years.

Workforce trend in the technology industry shows equally distributed proportion of workforces across all 3 categories of skilled workers, semi-skilled workers and unskilled workers for companies with 25 or less employees. It is interesting to note that about half of the sample has 25 or less employees across all 3 categories. Examining the future trends, it can be observed from Fig. 5.7 that there is a slight decrease in the demand for technology workforce in the next 5 years for the 25 and below employee category across all 3 skilled, semi-skilled and unskilled worker categories. However, the biggest decrease is in the semi-skilled worker category with almost 7 percent drop. For unskilled workers, there is the least drop in demand with only 2 percent decrease as shown in Fig. 5.7.

Again, as in the previous arguments, larger companies tend to have increased demand for skilled, semi-skilled and unskilled workers in the next 5 years as indicated by Fig. 5.7. This may again suggest that while smaller companies tend to have less demand for technology workforce in the future, larger companies on the other hand tend to have more demand for technology workforce within the next 5 years. This is particularly true in the semi-skilled category where the demand appears to be the greatest.

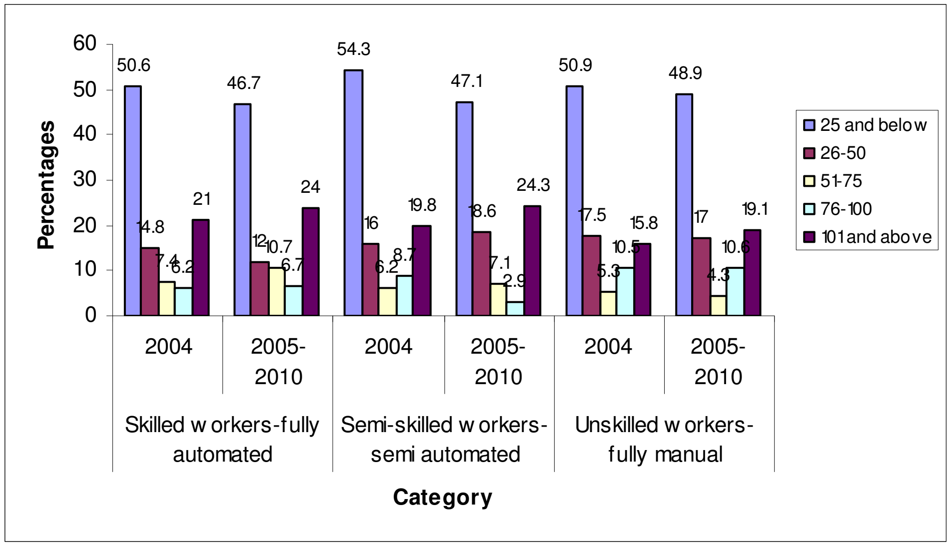

Figure 5.7: Distribution of workforce by technology

Fig. 5.8a and 5.8b show the distribution of workforce and future workforce demand in the ICT industry. As can be seen, the highest proportion of sample came from the computer support specialist category for the 25 and below employee group accounting for 92.2 per cent. Second is database administrator with 91.2 per cent. Next is the systems analyst category with 89.2 per cent of the 25 and below employee sample. This may indicate the current demand for ICT workforce is in the ICT support category, followed by the database administrator, systems analyst or application developer category and desktop publishing. The demand for hardware or computer engineering category is comparatively lower at 79.1 per cent of the 25 and below employee sample. However, in the next 5 years, the demand for computer engineers is predicted to increase by 2.0 per cent as suggested by the trend in Figure 5.8a. This is also true for desktop publishing specialists which are predicted to increase even more at 3.0 pe rcent in the next 5 years as can be observed in Figure 5.8b. Computer support specialists, systems analysts, and database administrators are expected to see a drop in demand for the next 5 years with between 3 to 4 per cent decrease.

Demand for non-ICT officer who uses computer in their daily operation shows quite a significant proportion of the sample. For companies with 25 and below employees, 59.7 per cent of the sample indicated employing non-ICT officers. This shows that almost 60 per cent of the sample employs non-ICT officers as knowledge workers, which can be considered as a significant development towards becoming a knowledge society. However, in the next 5 years the number of non-ICT workers is expected to drop by 7 per cent for companies who employ 25 or less employees. A closer look at the data shows an upward trend in the demand for non-ICT workers in the larger-sized companies. For instance in companies employing more than 100 employees, a 5.1 per cent increase in the number of non-ICT workers is expected in the next 5 years. Similarly for the 26 to 50 employee category, a 6.4 per cent increase has been predicted. This may suggest that larger companies requires more non-ICT workers in the future or the demand for k-workers is expected to increase for larger companies as opposed to small companies.

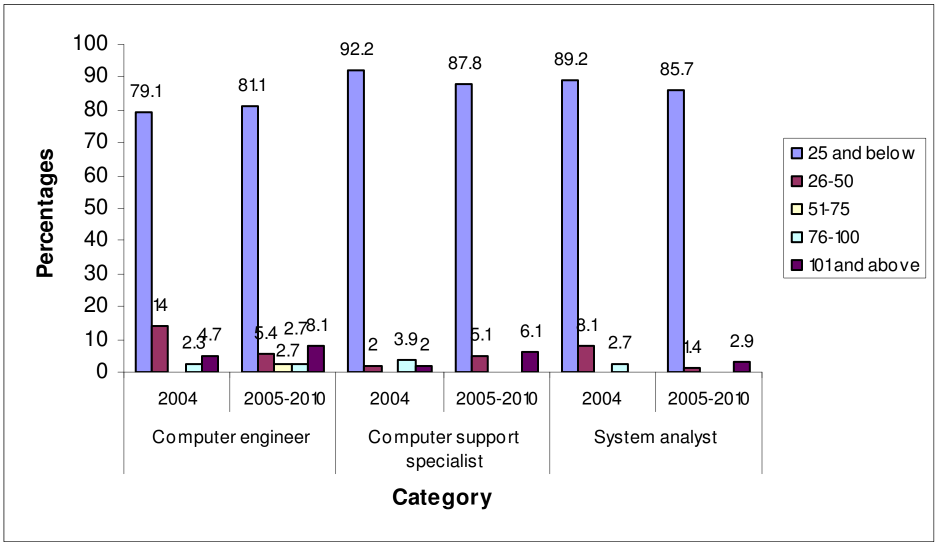

Figure 5.8a: Distribution of ICT workforce

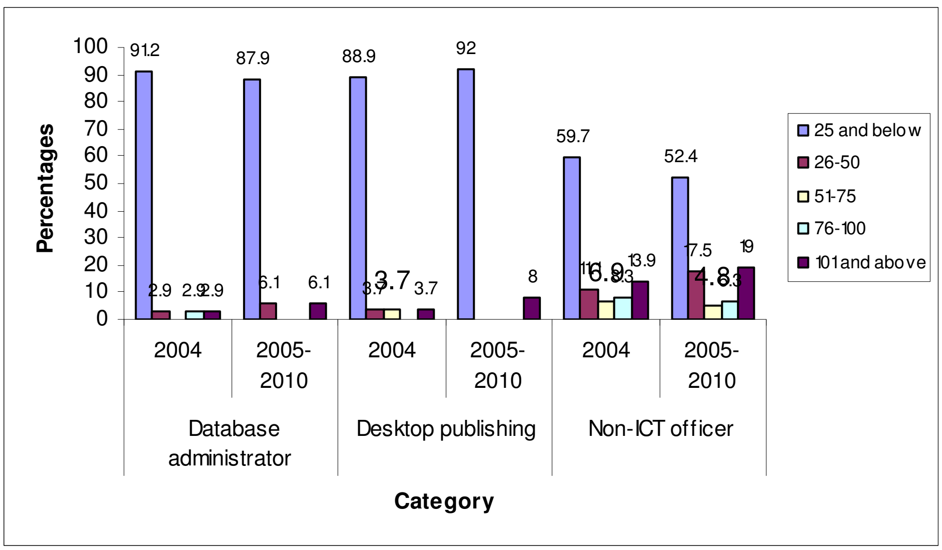

Figure 5.8b: Distribution of ICT workforce

Fig. 5.9 shows the comparisons on the level of ICT adoption in the administration, operation, and software usage. With the exception of software usage, the level of ICT adoption appears to be higher in the administration compared to the operations. In the administration, an average of 55.6 applications is used as semi-automated and only 31 applications are fully automated. In the operations, an average of 49.4 applications is used as semi-automated and only 28.2 applications are fully-automated. The results indicate semi-automated applications are dominant in both administration and operations functions. It is interesting to note that there is still manual usage of traditional word processing (usage of typewriter), manual spreadsheet, project planning, and human resource planning though on the average only 8.43 applications are manually done. It is understandable that software usage in fully-automated applications is the highest with an average of 61.9 percent. The sample respondents also indicated that a number of applications are in their planning with software usage top the list at 4.86 applications. The results also show more operations applications are in the pipeline as compared to the applications supporting the administration function.

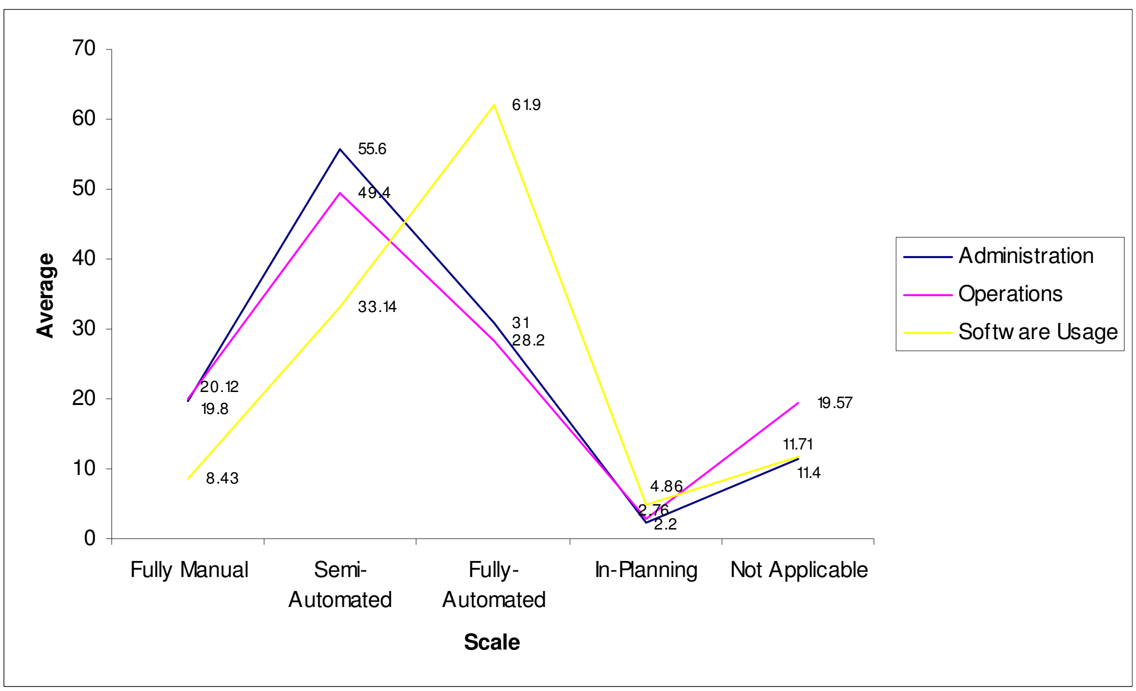

Figure 5.9: Comparison of level of ICT adoption

Fig. 5.10 shows the usage of e-business applications among the respondents. Three categories of e-business were captured. Business-to-business (B2B) is electronic transactions between companies, whereas business-to-customer (B2C) is the availability of electronic facilities provided by a company to its customers. Business-to-government (B2G) is part of the e-government initiative that provides online access for companies and individuals to access government services. The results show that only a small percentage of the sample has never experience e-business, ranging from 20 percent for B2C, to 21.7 percent for B2B and 25.8 percent for B2G. In other words, the results indicate up to 80 percent of the sample has the experience of participating in e-business and among the highest e-business participation is in the B2C category. This is followed closely by the B2B category. The B2G category however is the least though it is at 74.2 percent of the sample.

Among the most frequently used e-business is the B2C category, and the least used is the B2G category. There is still a wide opportunity to expand the e-government initiatives, particularly at the state, local government and down to the district and housing or village level. Only with such initiatives implemented can Malaysia fully realize the potential to achieve knowledge based economy with a knowledge base society.

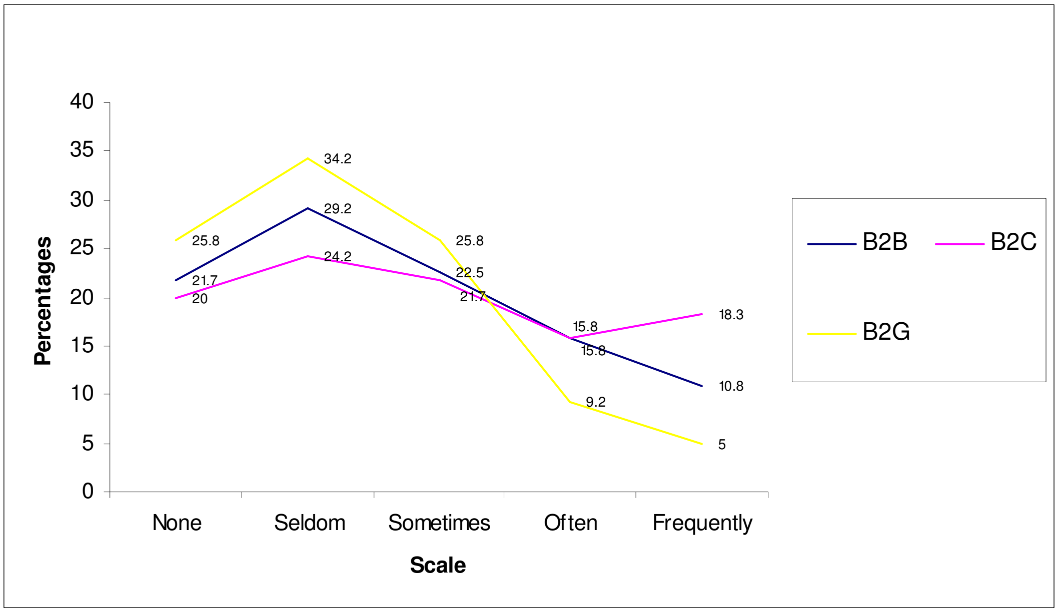

Figure 5.10: Usage of E-Business Applications

5.2 The Technology Adoption

On technology adoption, intermediate technology appears to be dominant in the fully and semi automated categories. This may suggest that solutions for technology adoption are currently most popular in the intermediate technology which could be more economical than integrated technology but have the power and capability that goes beyond stand-alone technology. Fig. 5.11 shows the trends in technology adoption from fully manual technology to fully automated technology. Intermediate technology is also dominant in the fully manual category. For future planning however, the trend indicates a shift to the integrated technology. This may suggests the direction the industry should take towards integrated technology as integrated solutions become more and more feasible and economical as organizations enter the era of globalization and become more competitive.

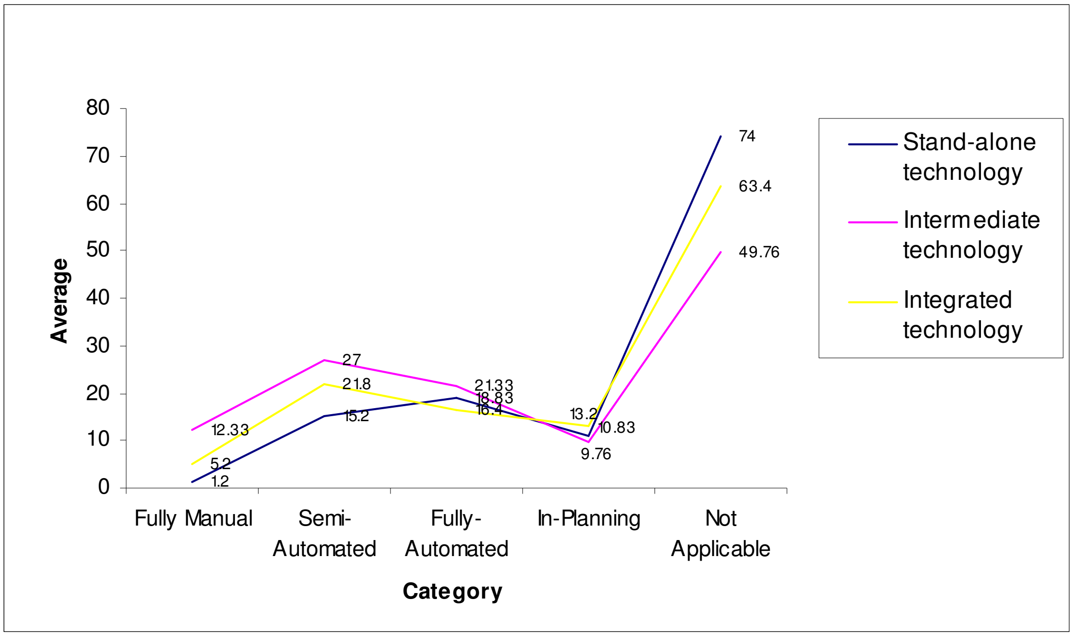

Figure 5.11: Technology adoption

5.3 The ICT Training and Adoption

As organizations embark on IT adoption, the requirements for ICT training become more and more important. Respondents were asked on the frequency of ICT training for their staff in the administration and operations. The result shows that administrative staff undergoes more frequent ICT training than their operations counterpart. This is somewhat surprising as operations personnel should be equipped with the necessary ICT skills and knowledge for them to be able to become effective and efficient end-users responsible for the day-to-day operations of the business. Fig. 5.12 shows the frequency of ICT training by the administrative and operations personnel.

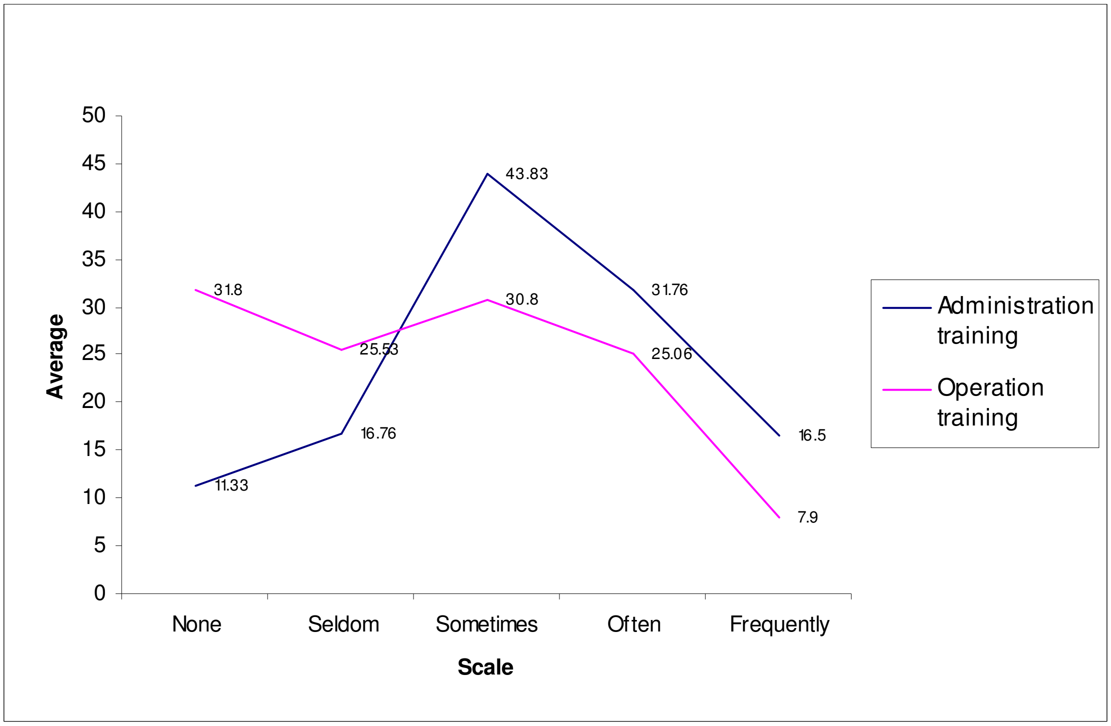

Figure 5.12: ICT training

Fig. 5.13 shows the frequency of technology training according to the three technology categories Stand-alone, Intermediate and Integrated technologies. The graph indicates a worrying trend in technology training, where in all the three technology categories a high proportion of the sample indicates having none or very little training in the technology they adopted. The result shows a decrease in the average technology training in all three categories as the frequency of training increases. Well competent and skillful technology adopters comes with adequate training and firms must be prepared to allocate appropriate training budget.

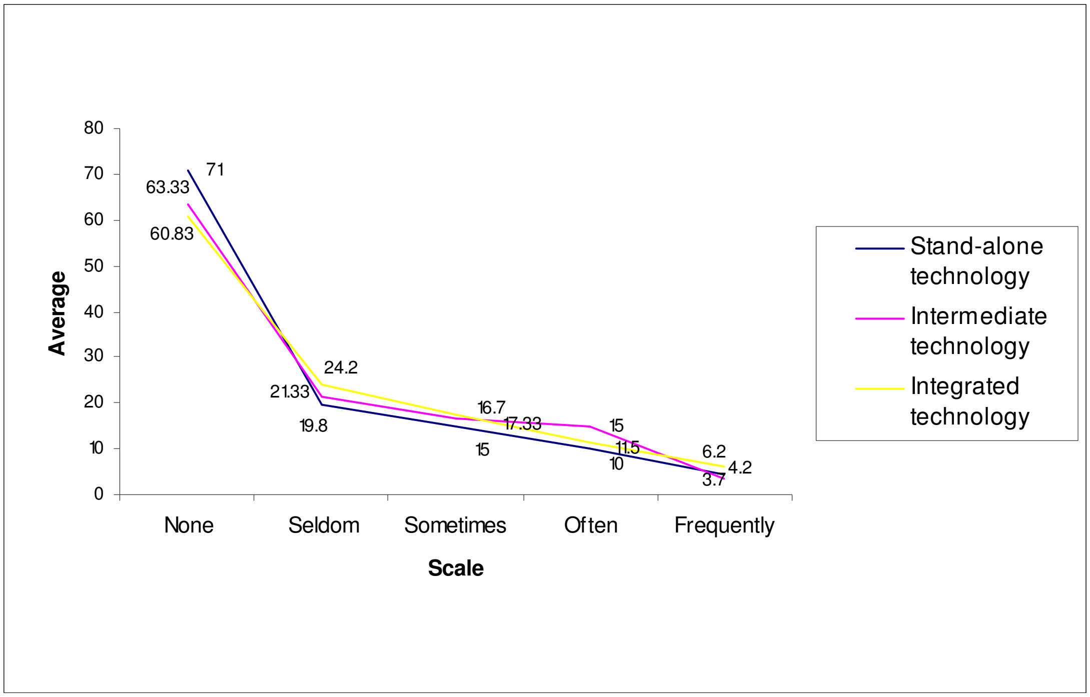

Figure 5.13: Technology training

The last part of the questionnaire examined the productivity of the respondent companies based on whether the companies are production based or service based companies, or both. Fig. 5.14 shows the result of the productivity trends from low, moderate to high productivity as indicated by the respondents. The result indicates that service based companies have better productivity performance than production based companies. The graph indicates productivity performance for service based industry increases from double in the low to moderate productivity to almost triple at the high productivity category. This result may suggest that more focus should be given to the service industry in order to help accelerate the Malaysian economy, particularly in our efforts to become a fully developed nation in the not too distant future.

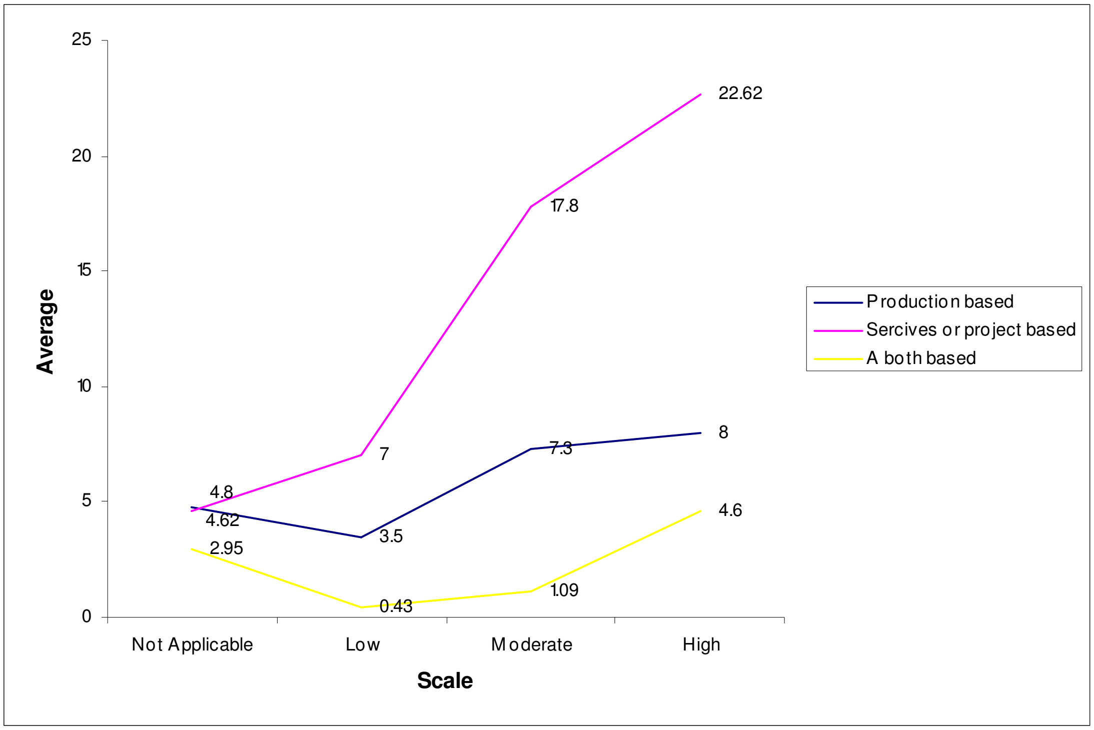

Figure 5.14: Measurement of productivity

5.4 The MSC Status of Company's with the Non MSC Status of Firm

Fig. 5.15 shows the distribution of companies with MSC status and non MSC status by ownership. The result shows only 9 companies in the sample are MSC status companies, 7 of which are Malaysian owned and 2 foreign owned. No government agencies in the sample attained the MSC status.

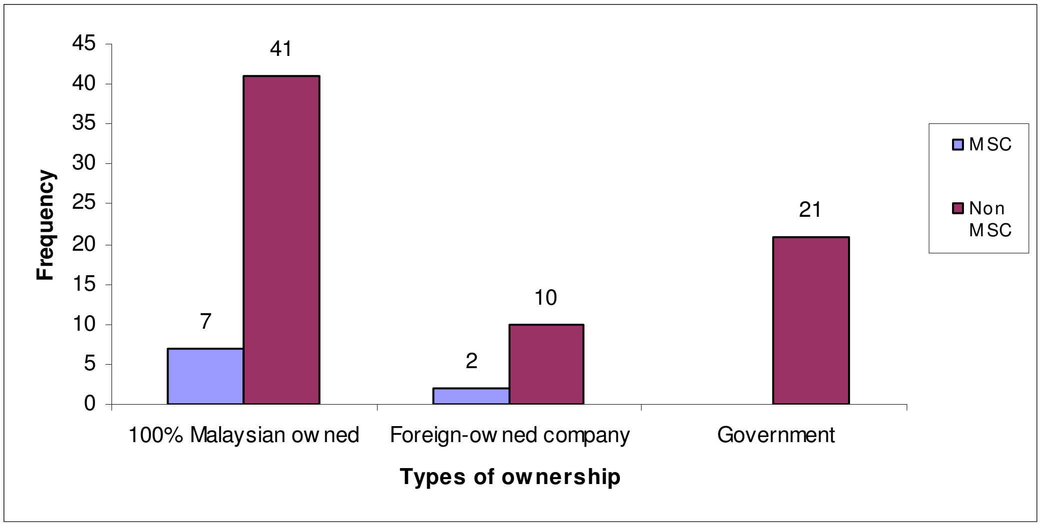

Figure 5.15: Distribution of MSC and Non-MSC Companies by Ownership

Fig. 5.16 shows the distribution of the MSC and non MSC status companies by size of employees. The result shows an almost equally distributed MSC status sample across the small, medium and large companies. However, for non-MSC status, the largest proportion comes from the small firm category.

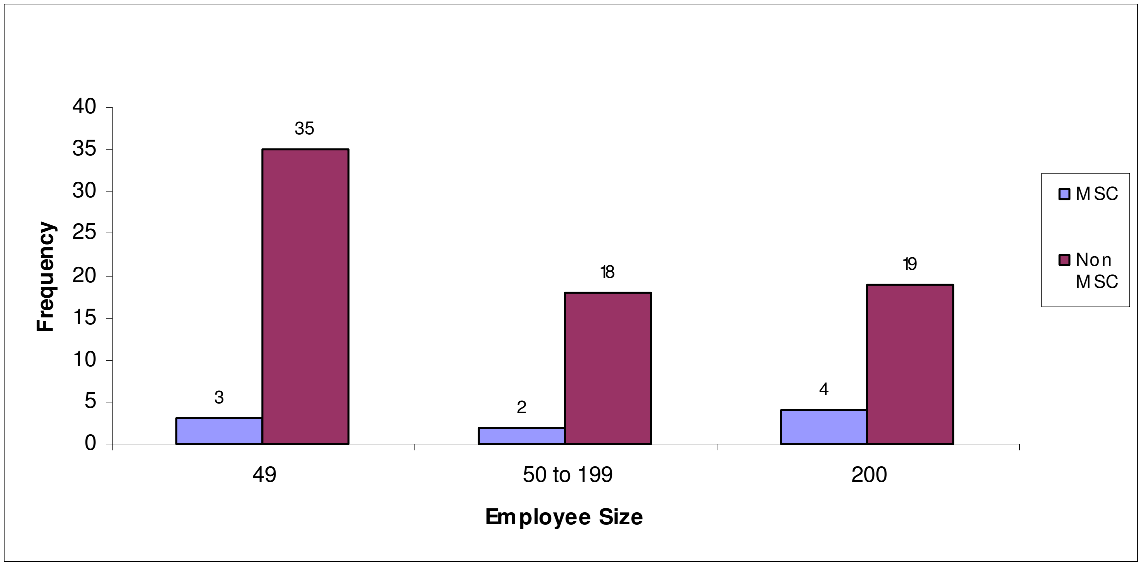

Figure 5.16: Distribution of MSC and non-MSC status companies by employee size

Fig. 5.17 shows the distribution of MSC and non MSC status companies by technology and ICT adoption. The result shows that more MSC status companies adopt both technology and ICT than their non MSC status counterparts. The result indicates MSC status companies tend to be equipped with technology and ICT better than the non MSC companies, perhaps due to the government initiatives through the Multimedia Development Corporation (MDC) in providing various incentives and schemes to the awarding companies.

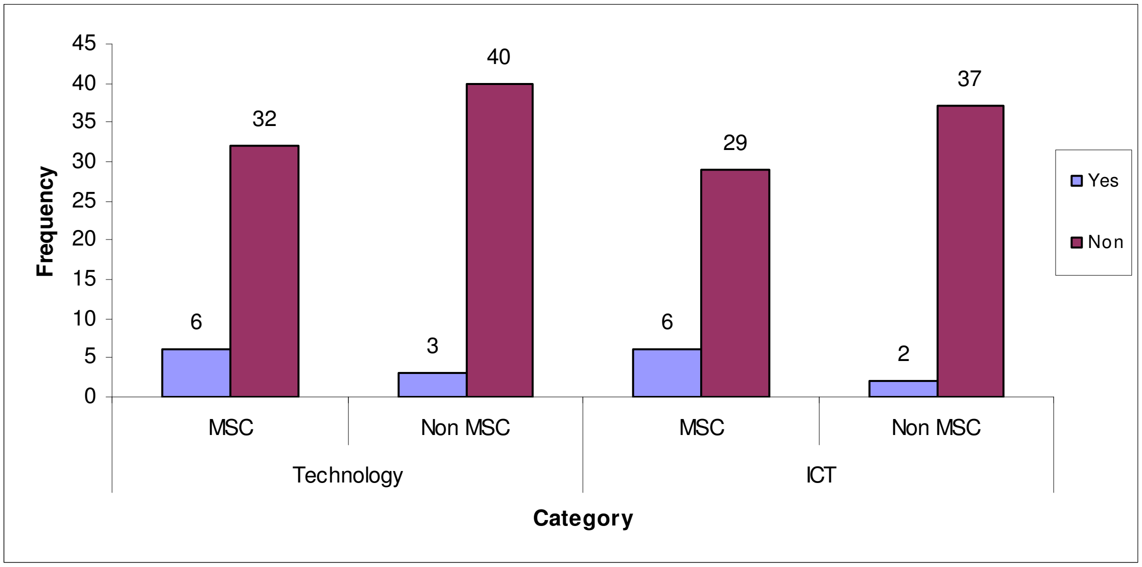

Figure 5.17: Distribution of MSC and non MSC status companies by technology and ICT adoption.

Fig. 5.18 shows the industry requirements for technology and ICT skilled workers among the MSC and non MSC status companies. The result for the non MSC status companies indicates almost identical requirements for skilled workers in both the technology and ICT industries. However further analysis could not be carried out for the MSC status companies due to inadequate sample.

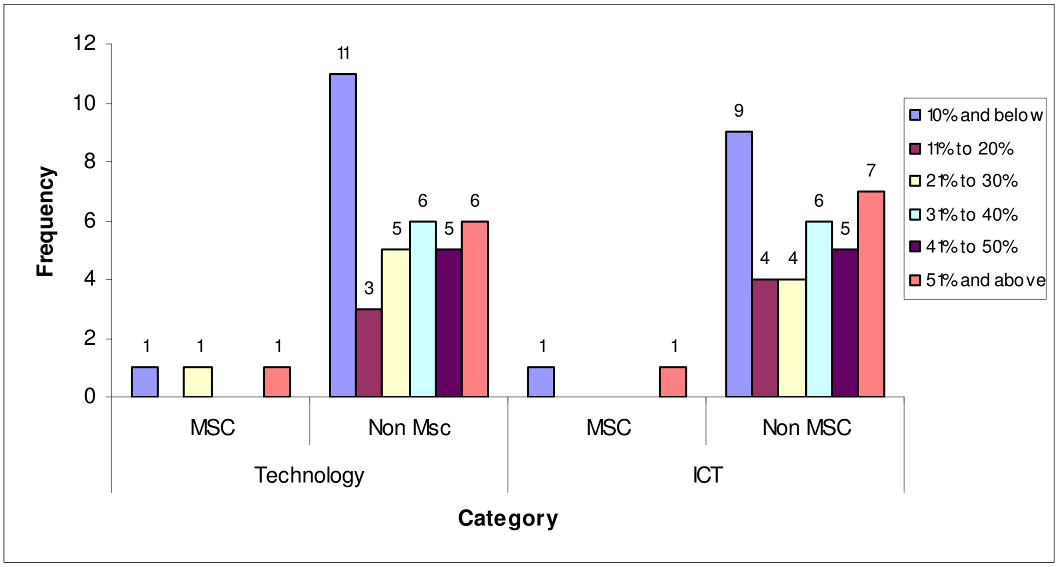

Figure 5.18: Distribution of requirements for technology and ICT skilled workers in the MSC and non MSC status companies.

Fig. 6.19 to Fig.6.23 show the requirements for the various IT professional categories in the MSC and non MSC status companies. Though the sample for MSC status companies was small, the result indicates future requirements for IT professionals for MSC status companies remain the same with the current situation. However, for the non MSC status companies, the same holds true for computer engineers and computer support specialists.

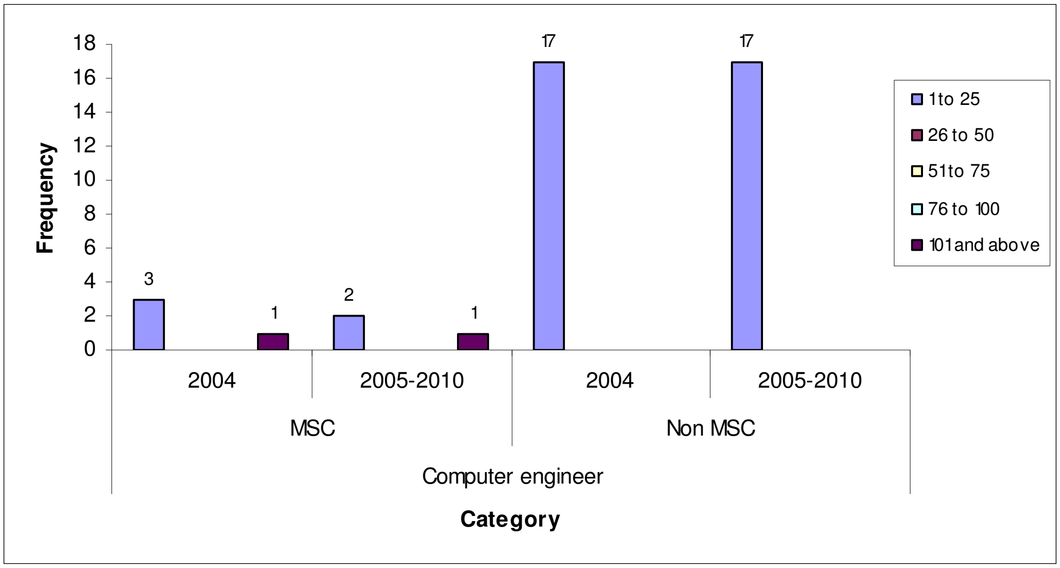

Figure 5.19: Requirements for computer engineers for the MSC and non MSC status companies

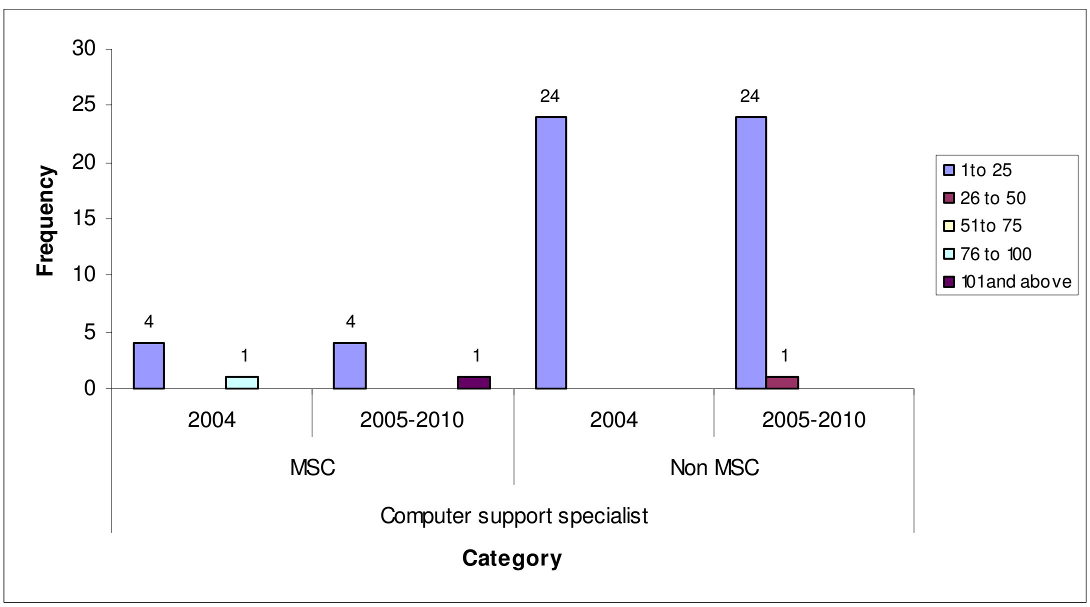

Figure 5.20: Requirements for computer support specialists for the MSC and non MSC status companies

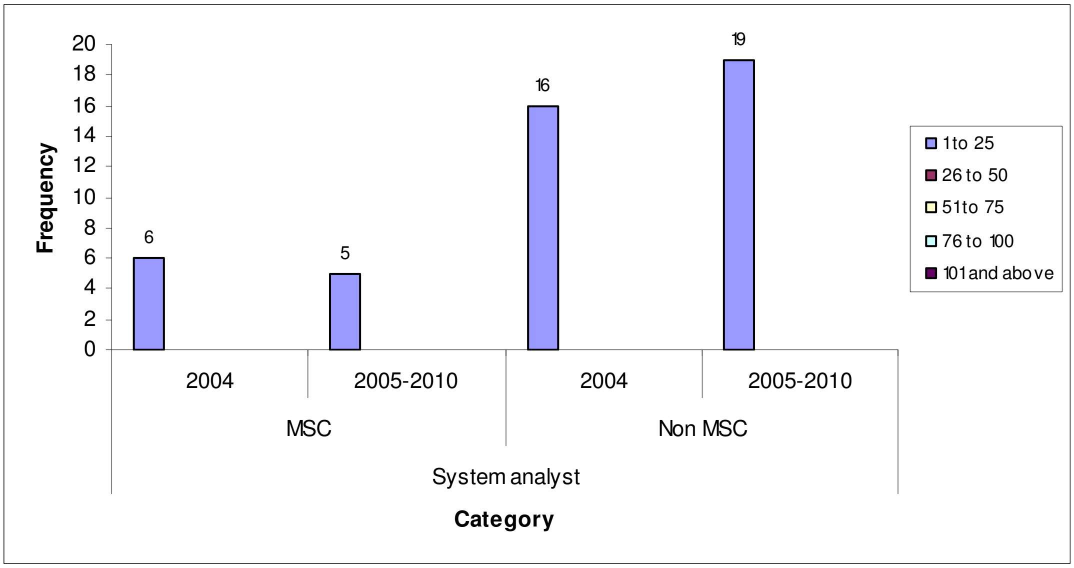

Figure 5.21: Requirements for systems analysts for the MSC and non MSC status companies

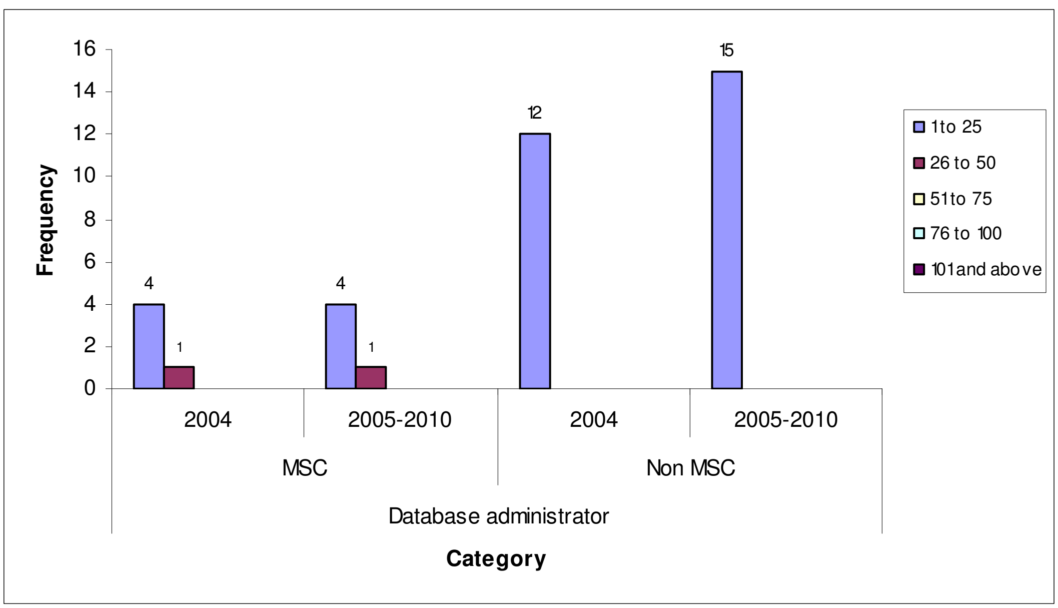

Figure 5.22: Requirements for database administrators for the MSC and non MSC status companies

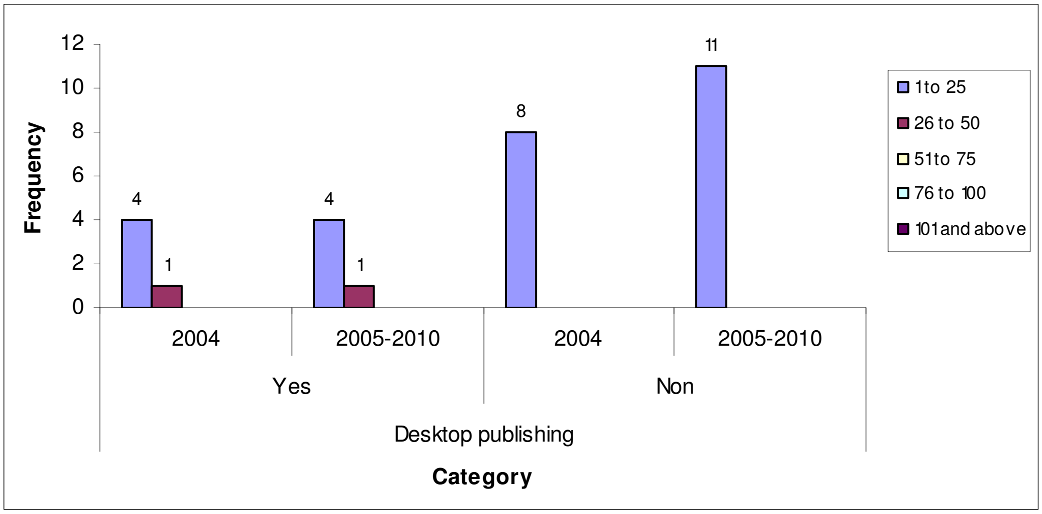

Figure 5.23: Requirements for desktop publishing specialists for the MSC and non MSC status companies

Fig. 5.21 to Fig.5.23 suggest an increase in future demand for IT professionals in the systems analysts, database administrators, and desktop publishing specialists categories in the non MSC status companies.

For other end-users, the result shows no marked differences for future end-user requirements in both the MSC and non MSC status companies, though there are slight decrease in demands for end-user computing for both categories particularly in the 1 to 25 employee group. Fig. 5.24 shows the requirements for end-user computing in the MSC and non MSC status companies.

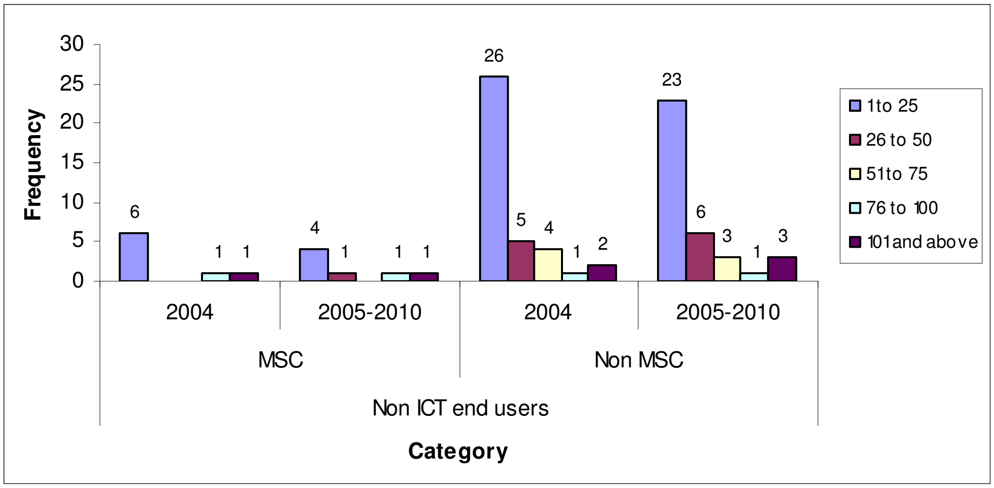

Figure 5.24: Requirements for other end-users for the MSC and non MSC status companies

Fig. 5.25 and Fig. 5.26 shows the distribution of ICT adoption in the administration function of the responding organizations for both the MSC and non MSC status companies. The results indicate ICT adoption in general is largely semi automated in both the MSC and non MSC status companies, and this is true in both the administration and operation functions.

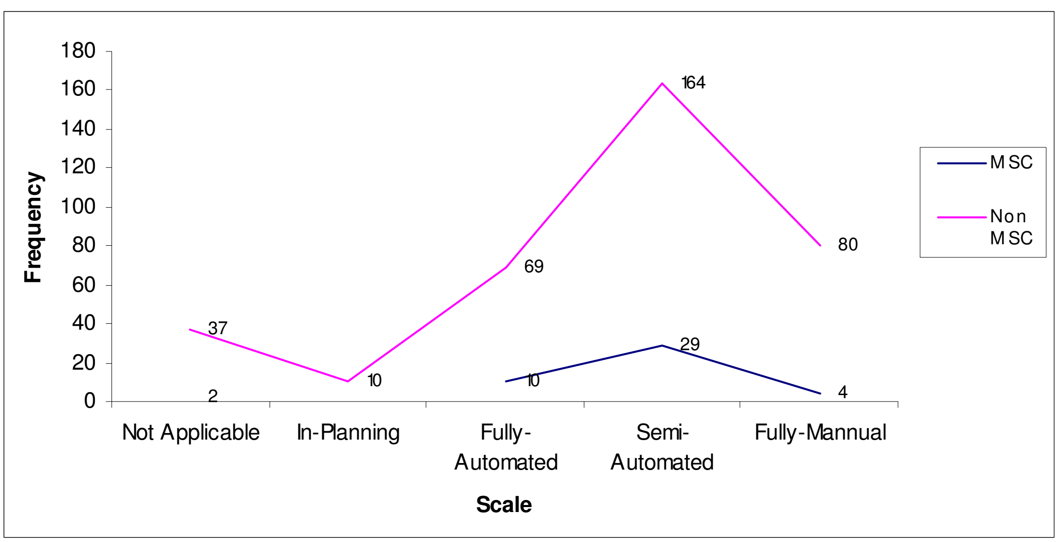

Figure 5.25: ICT adoption for administration in MSC and non MSC status companies

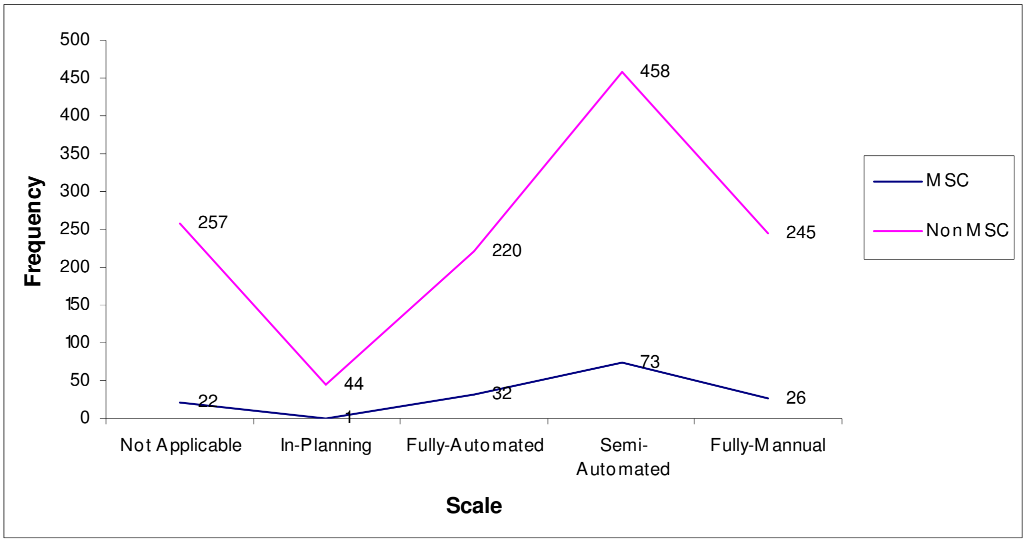

Figure 5.26: ICT adoption for operation in MSC and non MSC status companies

Fig. 6.27 shows the stand-alone technology adoption in the MSC and non MSC status companies. Most of the stand-alone technologies in the MSC status companies are fully automated, where as in the non MSC status companies, stand-alone technologies are still largely in the planning stage of adoption.

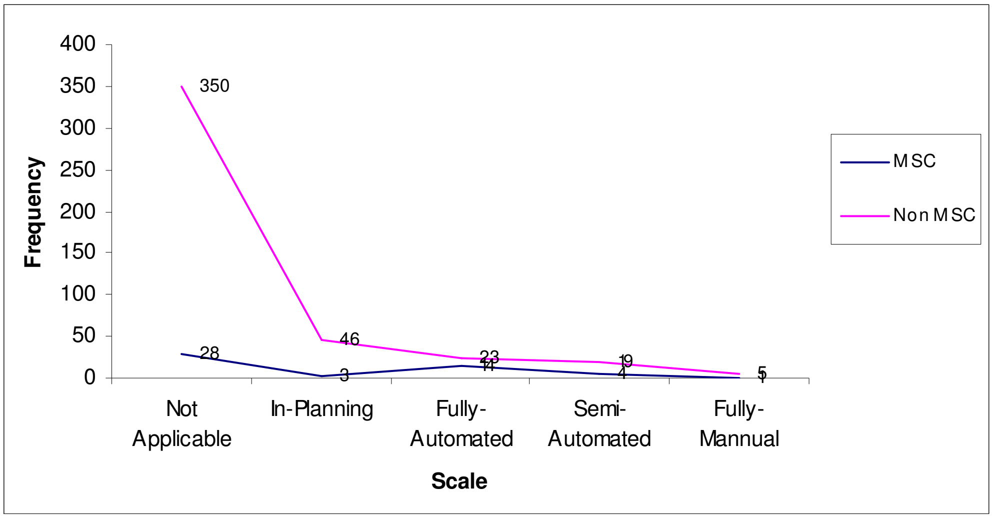

Figure 5.27: Stand-alone technology adoption in the MSC and non MSC status companies

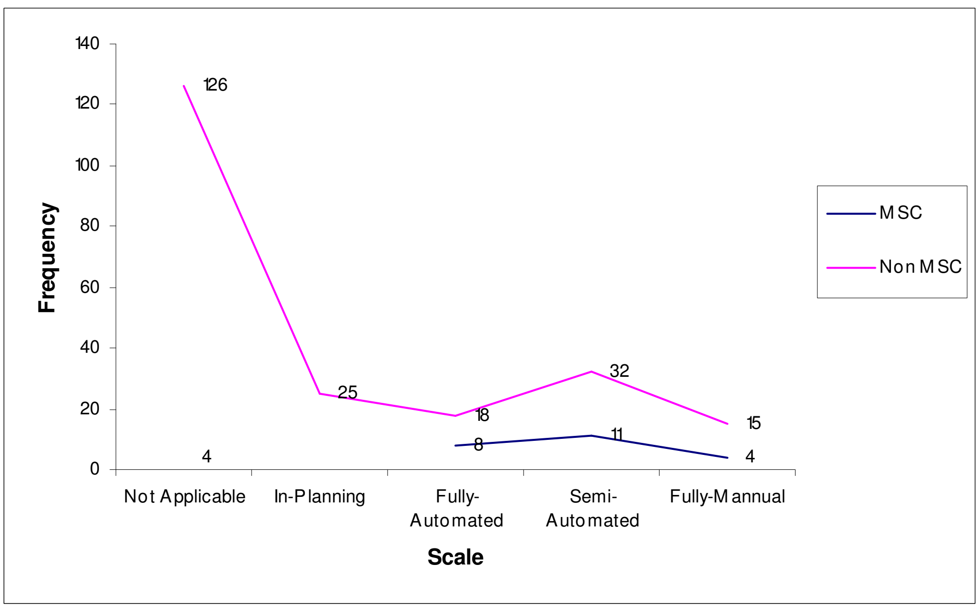

Figure 5.28: Intermediate technology adoption in the MSC and non MSC status companies

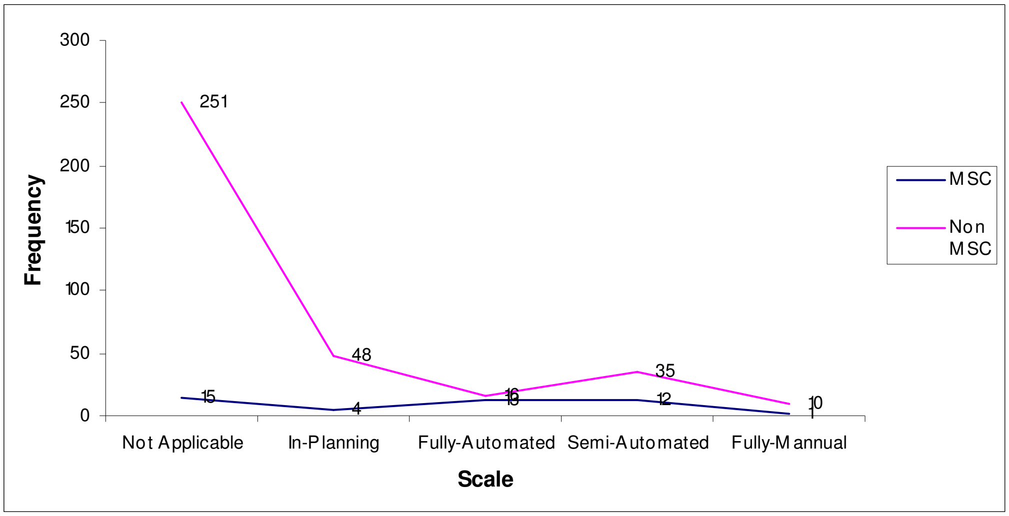

Figure 5.29: Integrated technology adoption in the MSC and non MSC status companies

For the intermediate and integrated technology adoptions, the results indicate technology adoptions in these categories are largely semi automated in both the MSC and non MSC status companies. Fig. 5.27 and Fig. 5.29 provide indications of this trend.

Fig. 5.30 shows the frequency distribution of the training programs for the MSC and non MSC status companies. The result indicates that the MSC status companies tend to have more frequent training for their administrative staff compared to the non MSC companies. This is also true for the operations staff, where the MSC status companies tend to have more frequent training than the non MSC companies. This is evidenced as shown in the graph of Fig. 5.31.

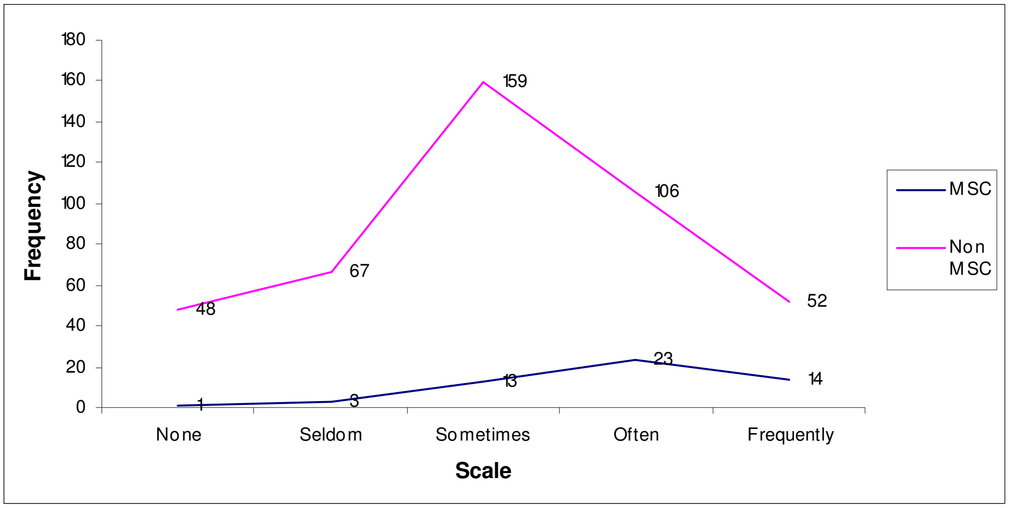

Figure 5.30: Frequency of training programs for the administration in the MSC and non MSC status companies

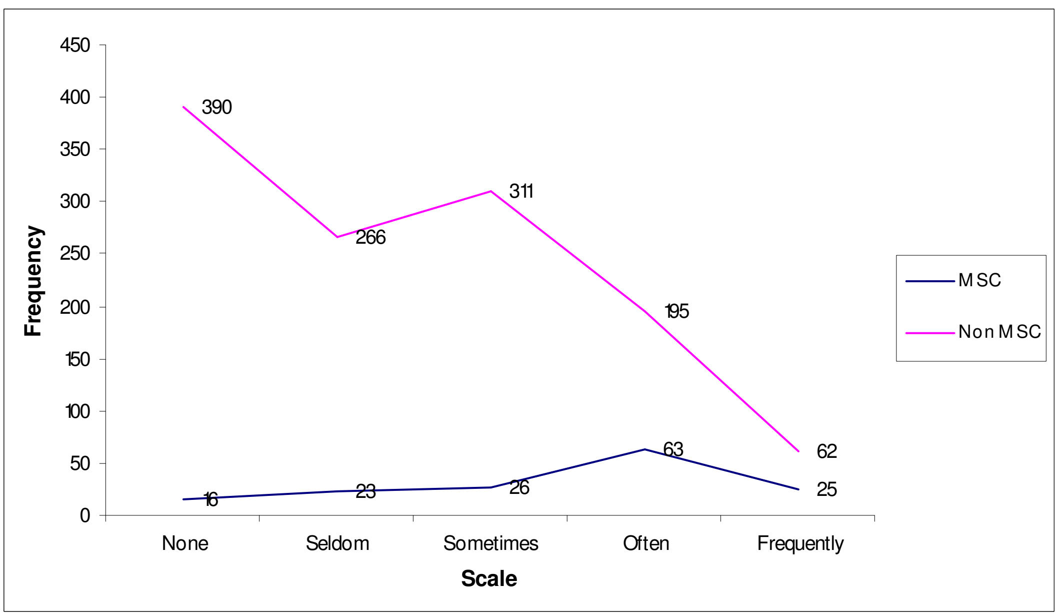

Figure 5.31: Frequency of training programs for the operations in the MSC and non MSC status companies

5.5 The Size of Firm

Fig. 5.32 shows the distribution of technology and ICT companies according to whether the companies have enough skilled workers and further categorized based on size of employee. In the technology category, companies with larger employees tend to have adequate skilled workers, but smaller technology companies tend not to have enough skilled workers. Similarly for ICT category, larger ICT companies tend to have enough skilled workers, but smaller ICT companies tend not to have enough skilled workers.

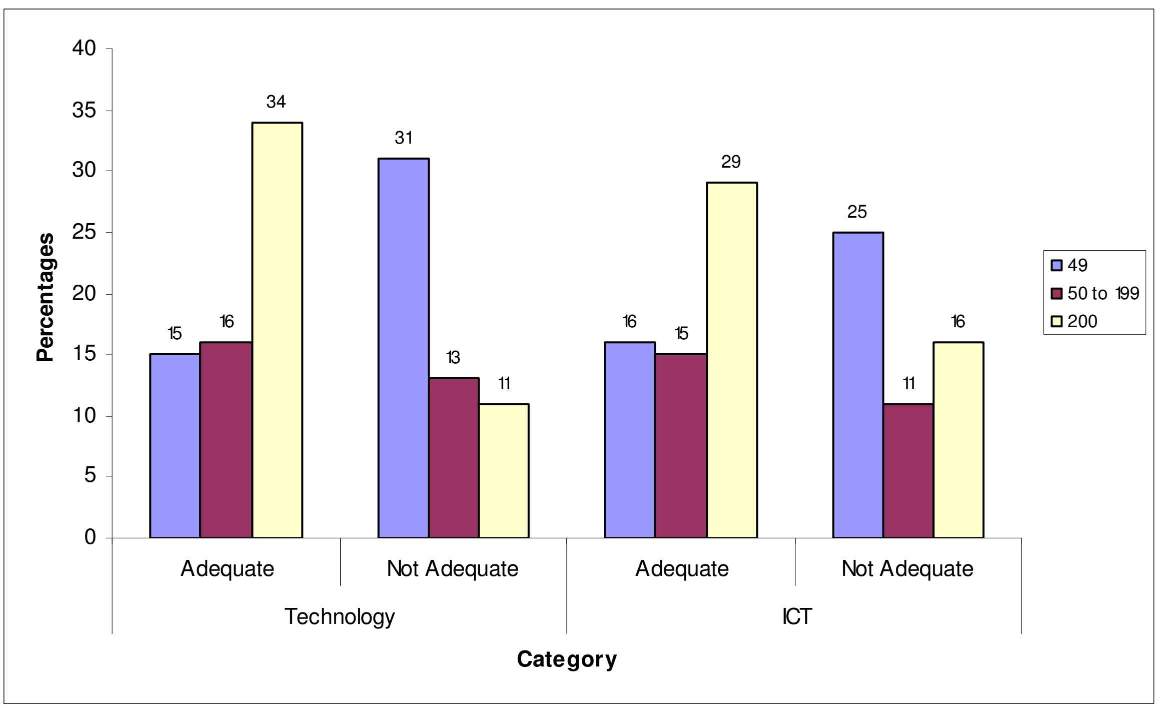

Figure 5.32: Adequacy of skilled workers in technology and ICT according to employee size

A closer look at the data revealed that among the small technology and ICT companies (less than 50 employees), the highest percentage of skilled workers required is 10 percent and 9 percent, respectively. Fig. 5.33 shows the detailed percentage breakdown of the technology and ICT companies grouped according to size of employees.

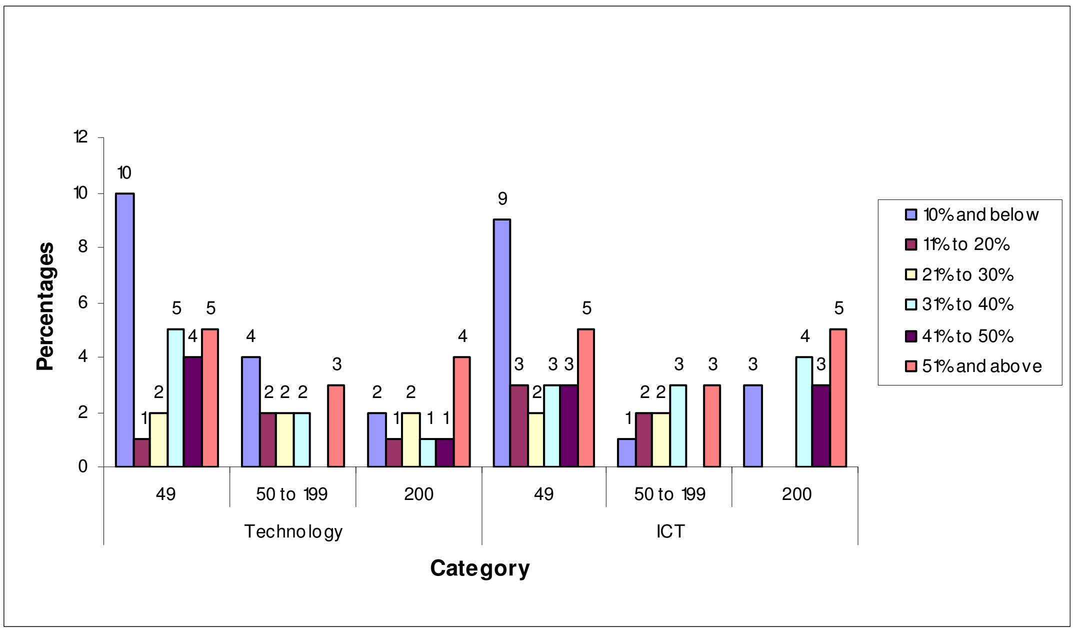

Figure 5.33: Technology and ICT companies with percentage of inadequate skilled workers grouped according to size of employees.

Fig. 5.34 shows the distribution of company ownership grouped according to size of employee. As can be seen from the figure, the number of Malaysian owned companies belonged to the majority of the small company sample and again in the large company sample. Majority of the medium range with 50 to 199 employees is the government sector.

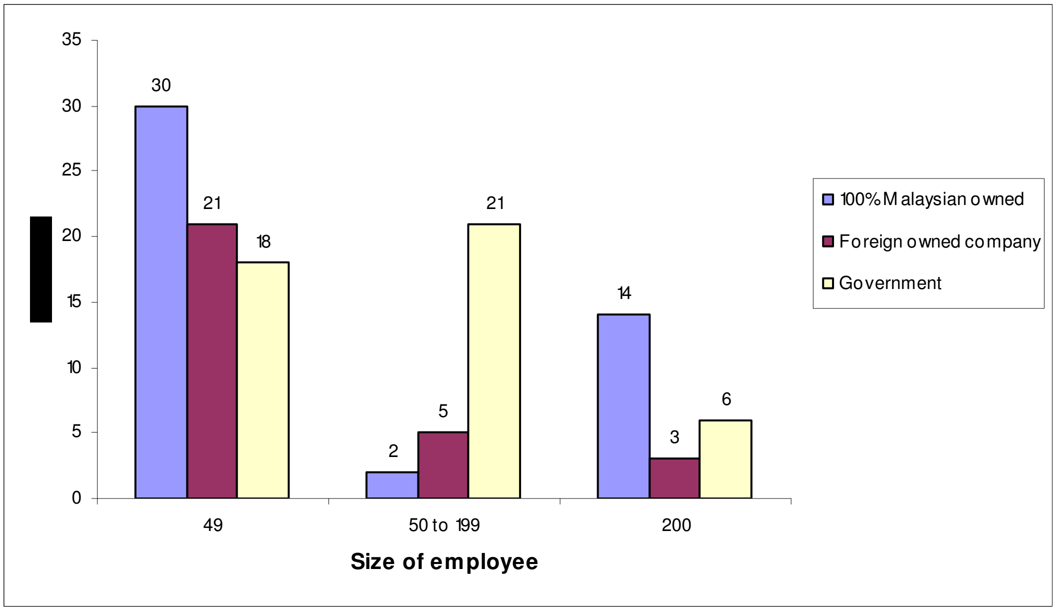

Figure 5.34: Ownership according to size of employees

Fig. 5.35 shows the distribution of the sample companies according to size of employees and State. Majority of the companies in the small and medium categories are from Selangor, followed by Perak and Kedah, while majority of the larger companies are from Penang, followed by Kedah and Perak.

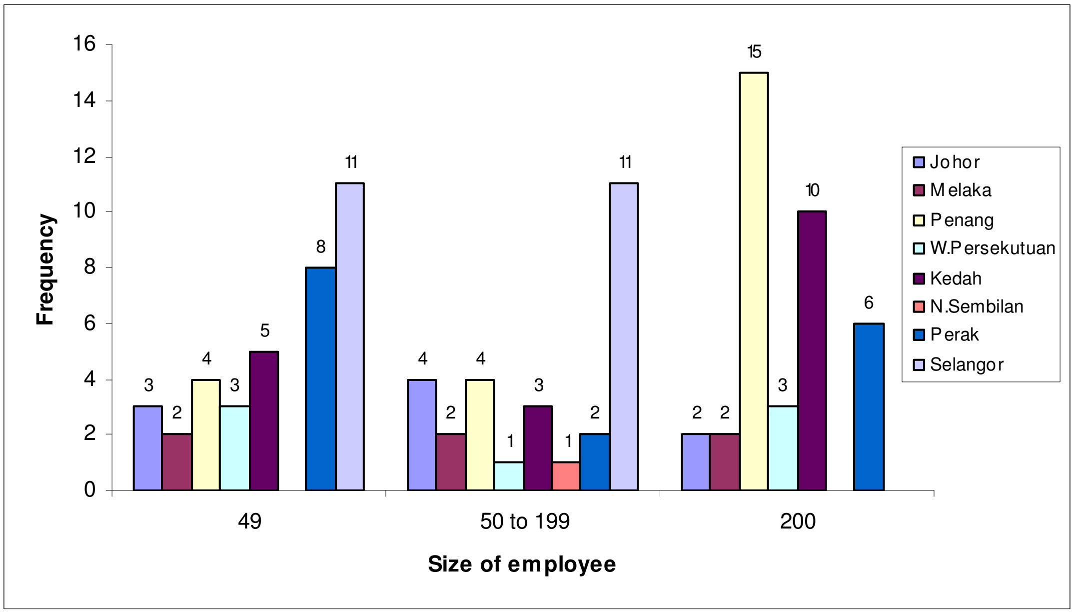

Figure 5.35: Distribution of companies according to size of employee and states

Fig. 5.36 to Fig. 5.40 show requirements for IT professionals grouped according to size of employees. Since majority of the sample represents the 1 to 25 IT professionals, analysis will only be focused within this group. Demand for computer engineers saw a slight decrease particularly in the large companies, whilst the small and medium sized companies were somewhat the same. Similarly with computer support specialists, where slight decrease in demand can be seen in the large company category, whilst the small and medium sized companies remain the same.

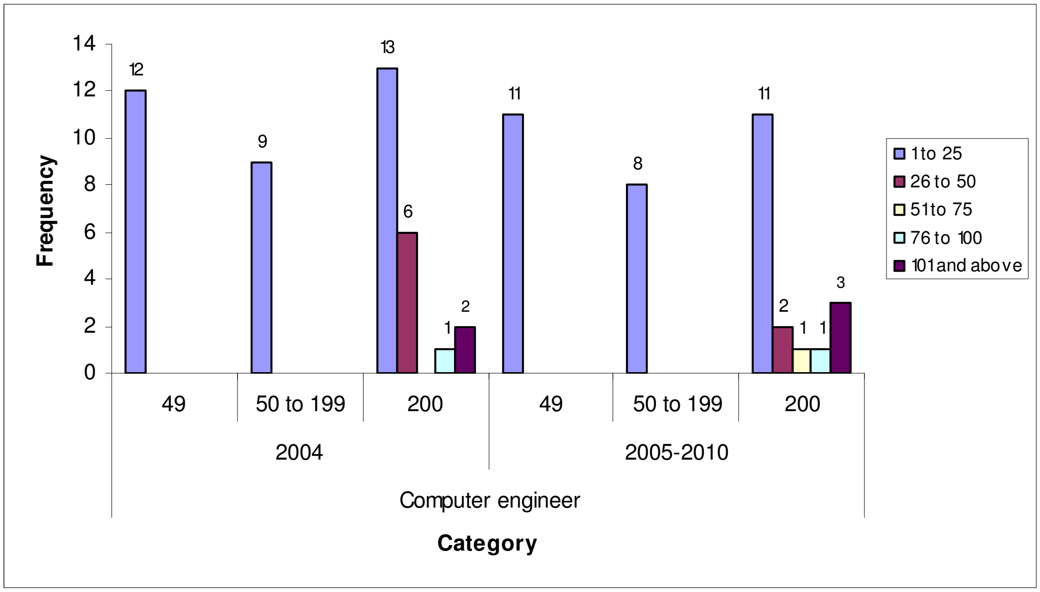

Figure 5.36: Requirements for computer engineer according to size of employees

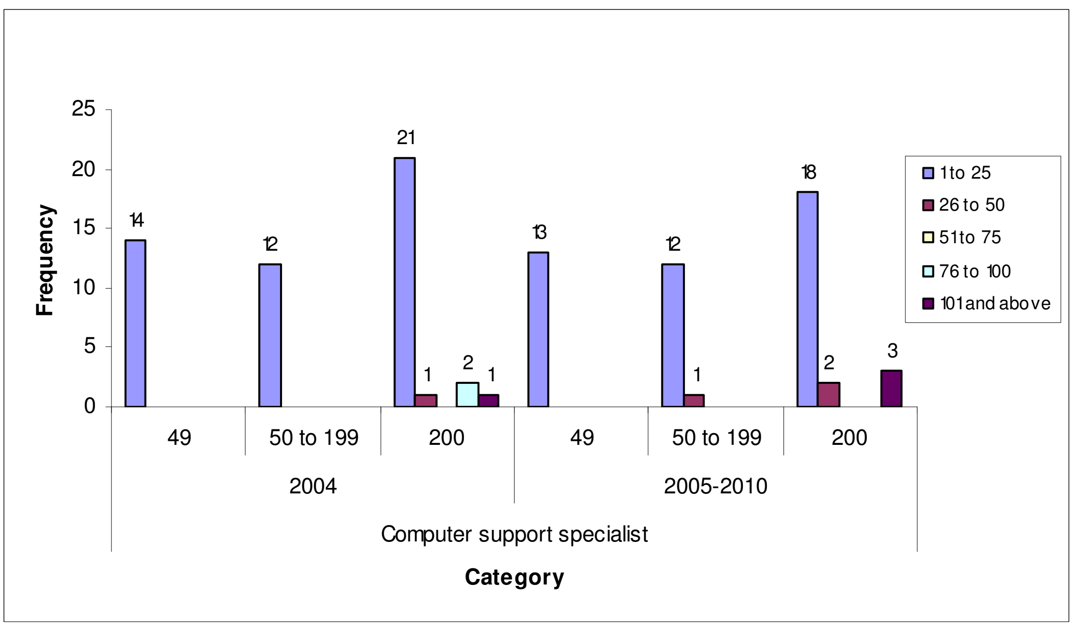

Figure 5.37: Requirements for computer support specialist according to size of employees

As for systems analysts, there is an increase in demand in the small company category as shown in Figure 5.38. Whilst the large companies saw a decrease in demand, the medium companies predicted somewhat the same requirement for future systems analysts.

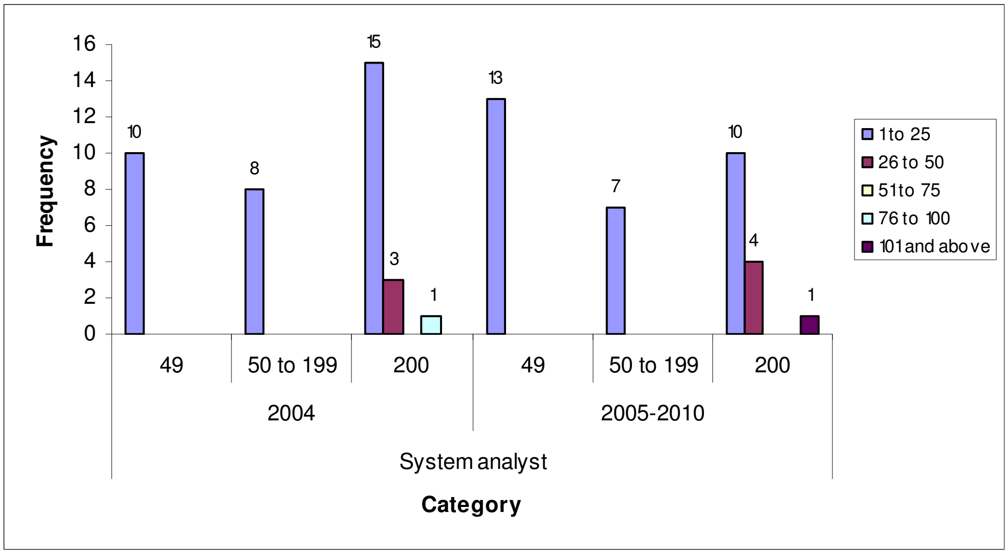

Figure 5.38: Requirements for systems analysts according to size of employees

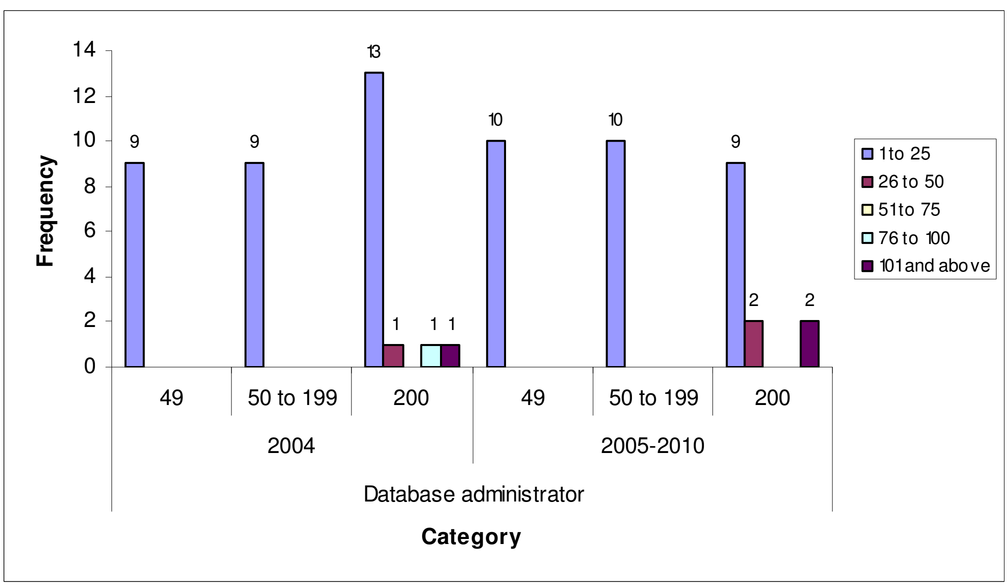

Figure 5.39: Requirements for database administrator according to size of employees

Requirements for database administrators saw a drop in demand for the large company category as shown in Fig. 5.39. The small and medium companies require about the same database administrators in the next 5 years.

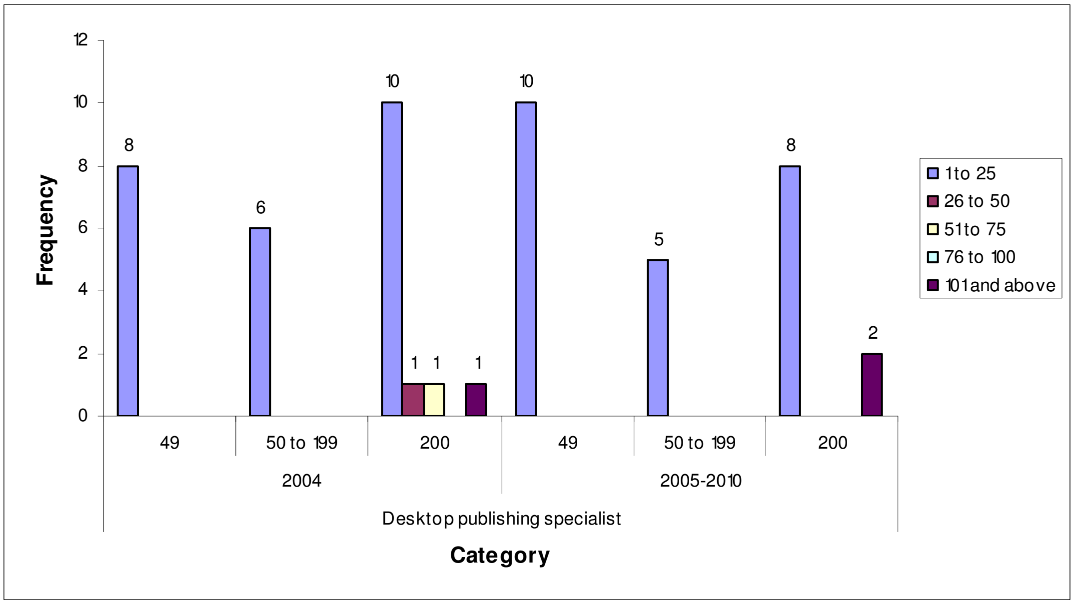

Figure 5.40: Requirements for desktop publishing specialists according to size of employees

Demands for desktop publishing specialists saw a slight increase in the small company category as shown in Fig. 5.40. However, for the large company category the trend appears to be the opposite with a slight decrease in demands. The medium company category appears to remain unchanged.

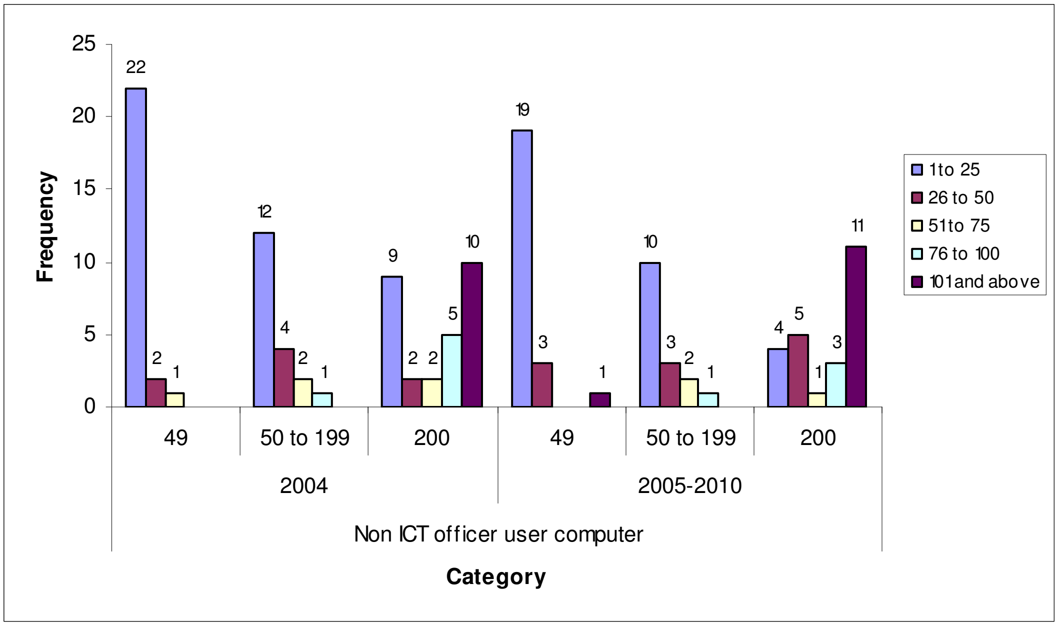

Figure 5.41: Requirements for end-user computing according to size of employees

The demand for end-user computing seems to be dropping in all three categories of company sizes as shown in Fig. 5.41. However, in the large sized companies, the trend appears to be mixed with no definite pattern. There was a clear drop in demand for large companies employing 25 or less end-users, but those with more than 100 end-users saw a somewhat same demand.

Fig. 5.42 and Fig. 5.43 show the ICT adoption in the administration and operations functions. The results show both the administration and operations functions were largely semi-automated. Only the large sized companies appears to accelerate full automation in both the administration and operations functions compared to the small and medium sized companies.

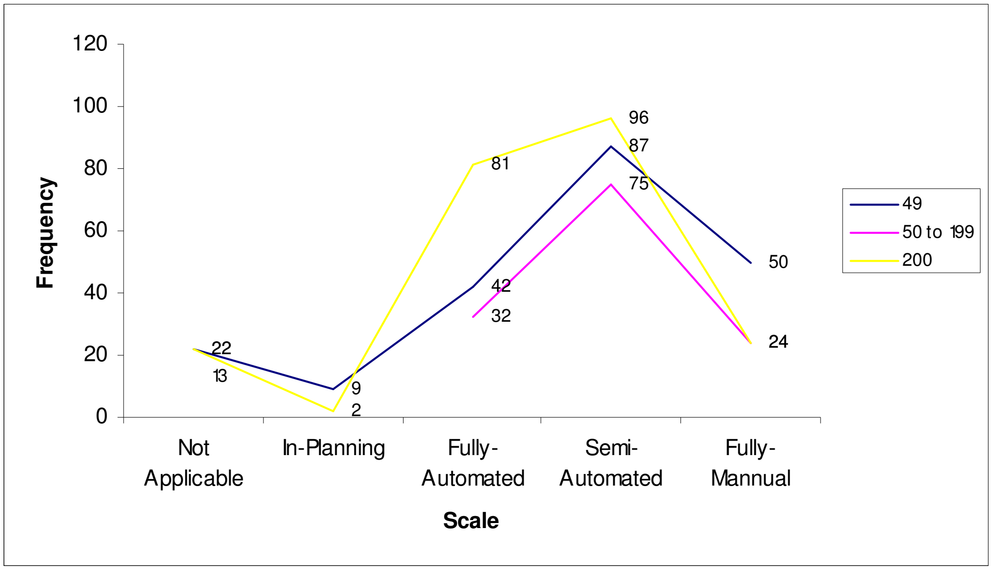

Figure 5.42: ICT adoption in the administration function according to size of employees

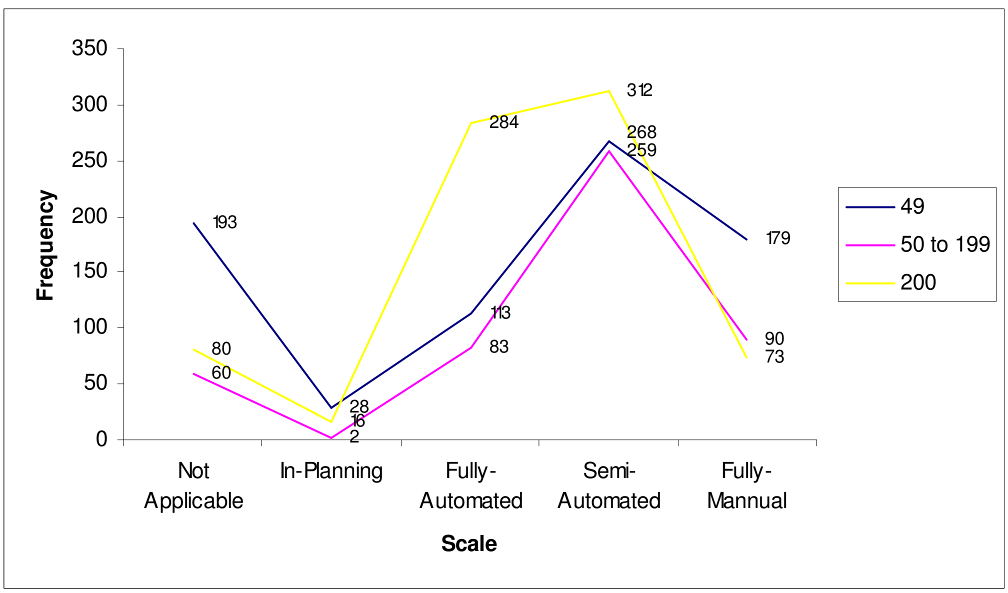

Figure 5.43: ICT adoption in the operations function according to size of employees

Fig. 5.44 to Fig. 5.46 show the automation trends in technology adoption according to size of employee. Stand-alone technology appears to be prevalent in full automation in all three company categories as shown in Fig. 5.44.

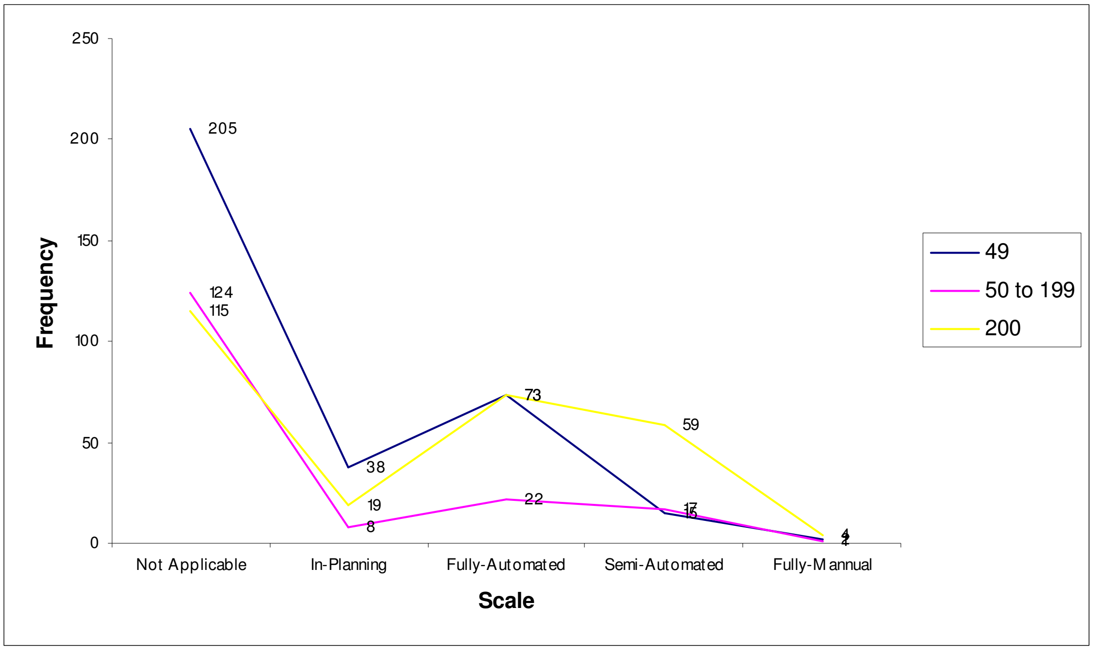

Figure 5.44: Automation trends in stand-alone technology according to size of employees

For intermediate technology adoption, the trend is semi-automated in all three company categories, but the small sized companies are basically still manual. As with ICT adoption, large sized companies appear to be going towards full automation in the intermediate technology adoption.

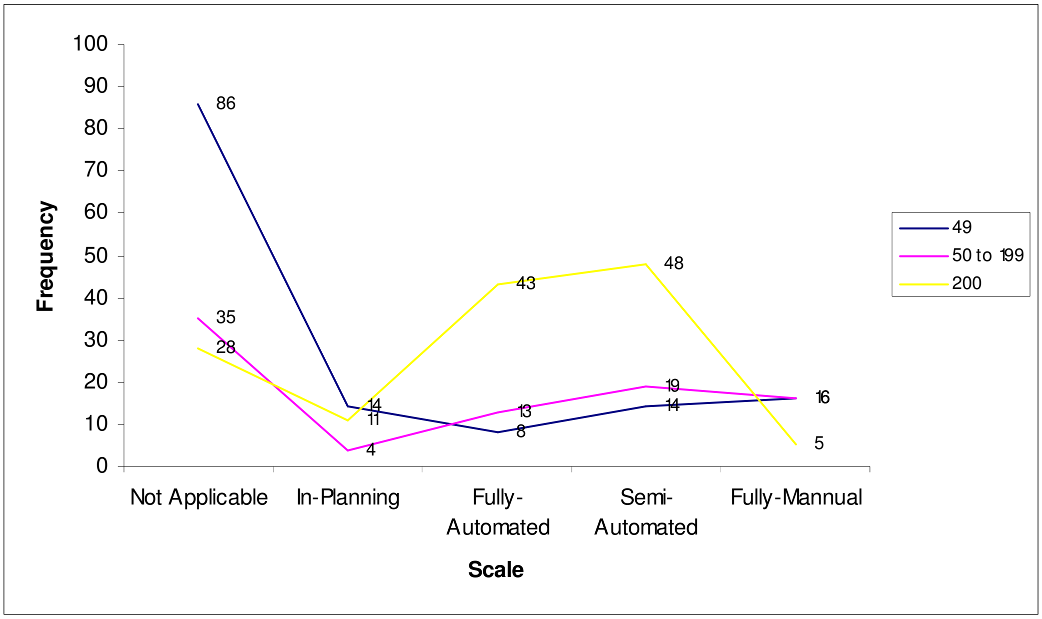

Figure 5.45: Automation trends in intermediate technology according to size of employees

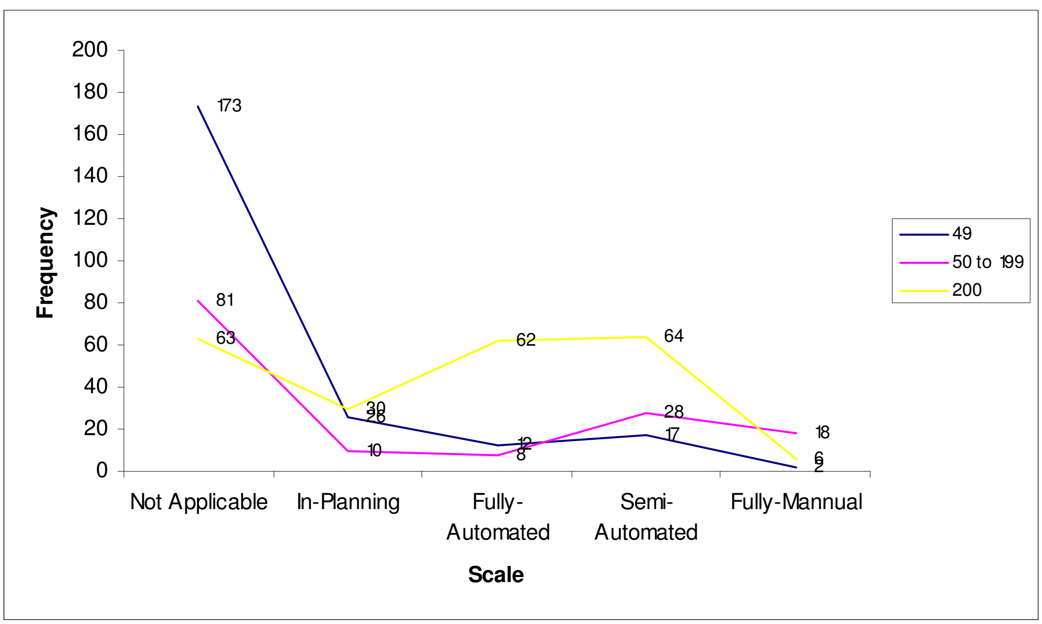

Figure 5.46: Automation trends in integrated technology according to size of employees

For integrated technology adoption (Fig. 5.46), current adoption is still semi-automated in all three company categories. Again, large sized companies tend to increase their integrated technology adoption to full automation.

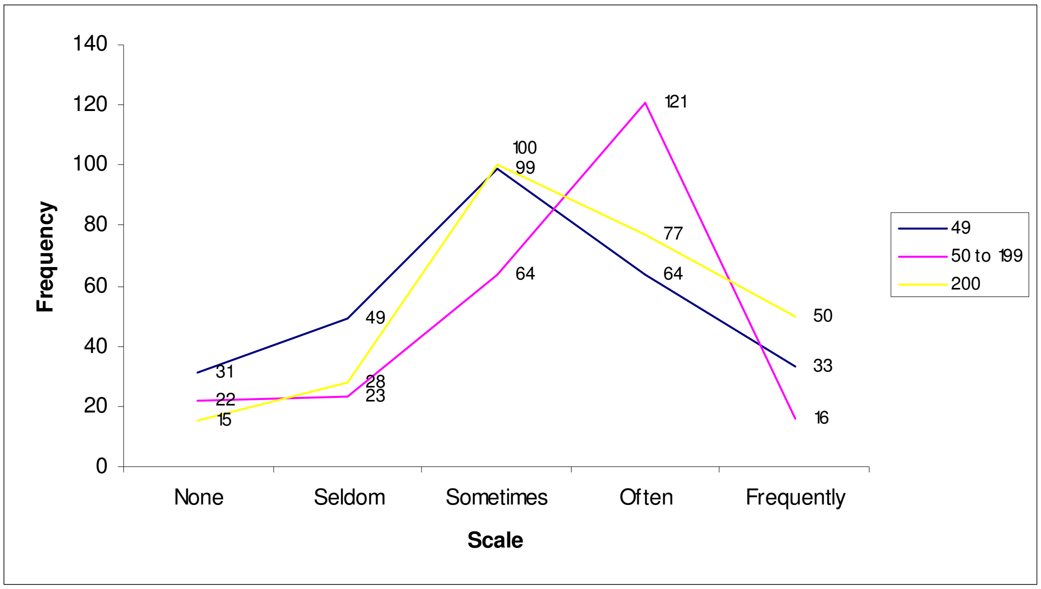

Figure 5.47: ICT training requirements for administrative staff according to size of employees

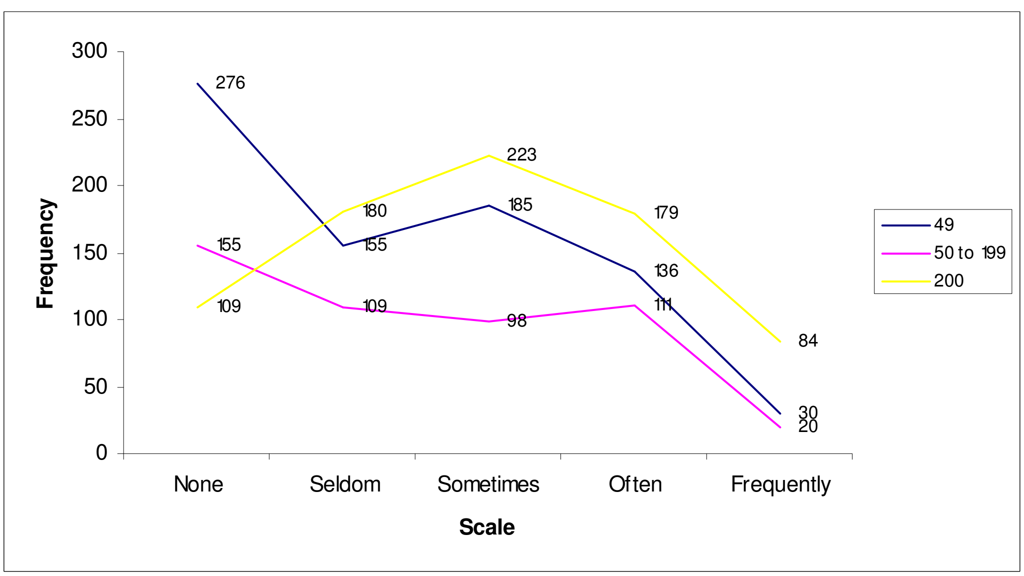

Figure 5.48: ICT training requirements for operations staff according to size of employee

Fig. 5.47 and Fig. 5.48 shows the ICT training requirements for administrative and operations staff grouped according to size of employee. Medium sized companies appear to have more regular training programs for their administrative staff compared to the small and large sized companies as shown in Fig. 5.47. However, a surprisingly high number of small companies did not have any training programs for their staff as shown in Figure 5.48. To a certain extent this is also true for the medium sized companies.

Fig. 5.49 to Fig. 5.51 show technology training requirements according to size of employee. It is surprising to see that stand-alone and intermediate technology training were lacking in all three categories of companies, with no training at all appears to be the majority as shown in Fig. 5.49 and 5.50. For those companies that sends their staff for training, large and medium sized companies appears to be sending their staff more often in the stand-alone and intermediate technology programs.

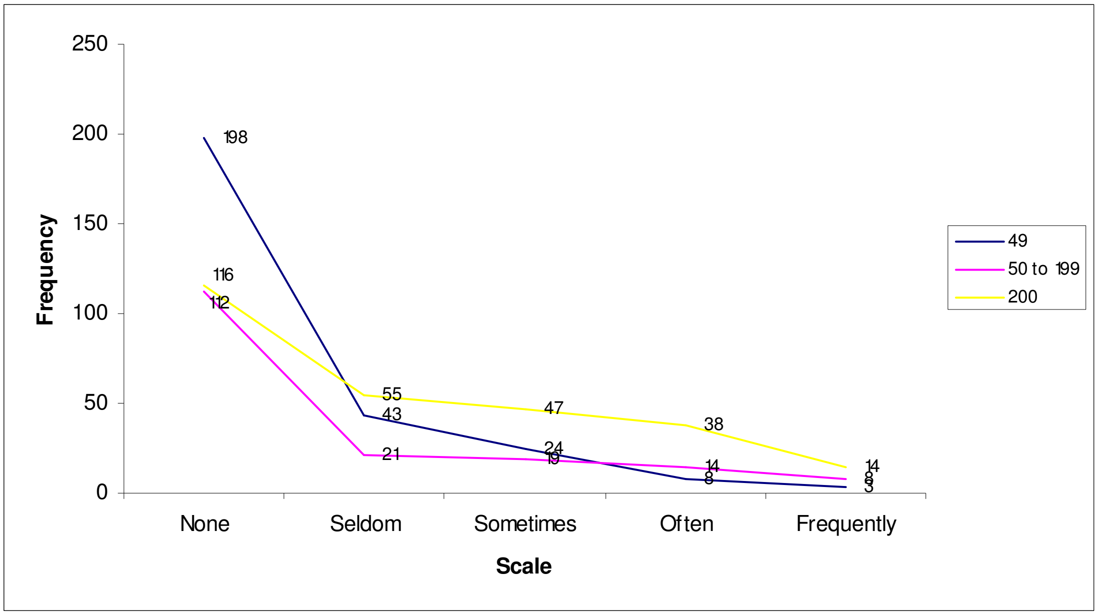

Figure 5.49: Stand-alone technology training requirements according to size of employees

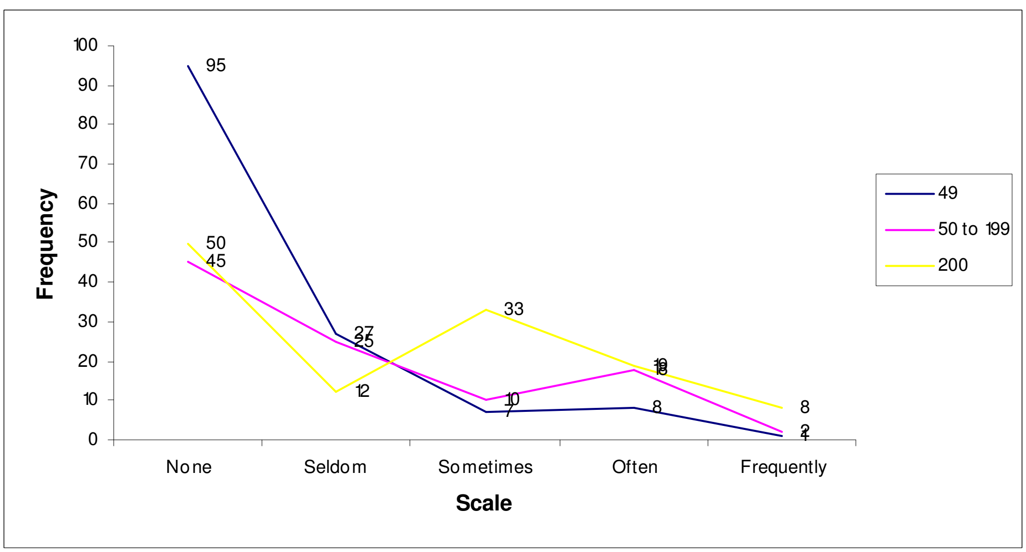

Figure 5.50: Intermediate technology training requirements according to size of employees

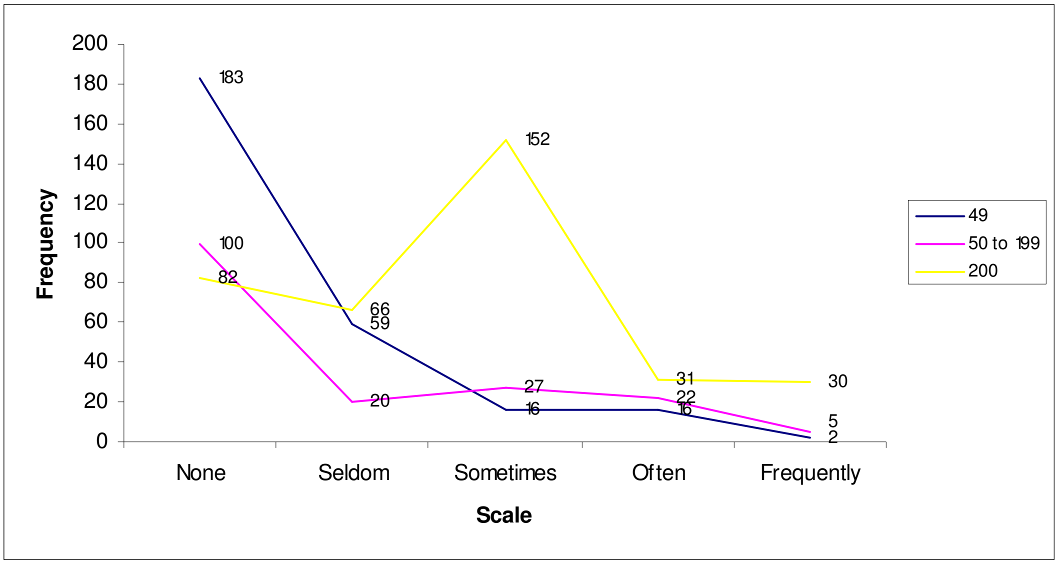

Figure 5.51: Integrated technology training requirements according to size of employees

Fig. 5.51 shows the integrated technology training requirements for the three company sizes. Large sized companies appear to have more frequent integrated training for their staff, and this is also true for medium sized companies to a lesser extent. Small sized companies have the least integrated training and the most in terms of no training given to their staff. This appears to be consistent across all three types of technology adoption.

Fig. 5.52 shows the current and future requirements for IT professionals according to ownership of the organization. Since samples from the government sector is too small, analysis will only be observed for the Malaysian owned and foreign owned companies. As can be seen from the figures, there is a slight decrease in demand for computer engineers in the Malaysian owned companies, but the demand is quite the same for foreign owned.

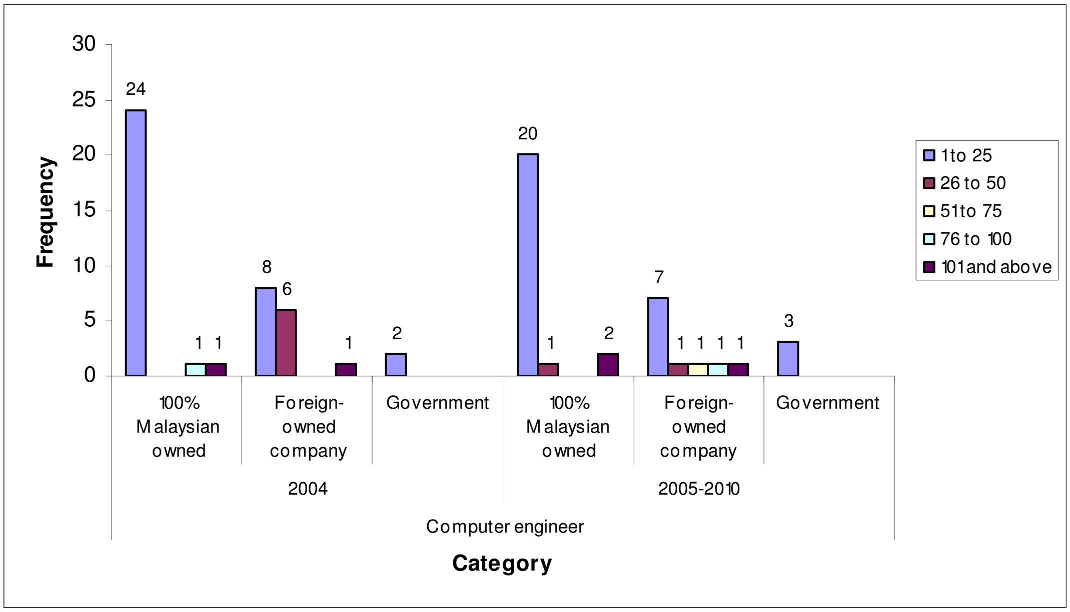

Figure 5.52: Demands for computer engineers according to size of employees

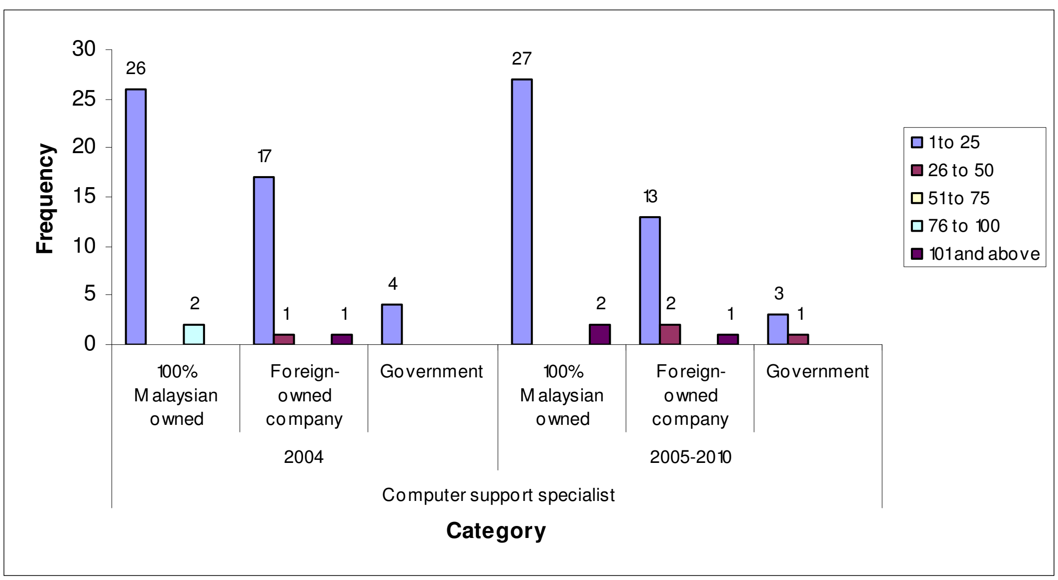

Figure 5.53: Demands for computer support specialists according to ownership in company's

However, computer support specialists (Fig. 5.53) and systems analysts (Fig. 5.54) show almost no increase or decrease in demand in the Malaysian owned companies, but a decrease in demand for foreign owned companies. Requirements for database administrators, on the other hand, show a big demand for Malaysian owned companies but a slight drop in demand for foreign owned companies as shown in Fig. 5.55

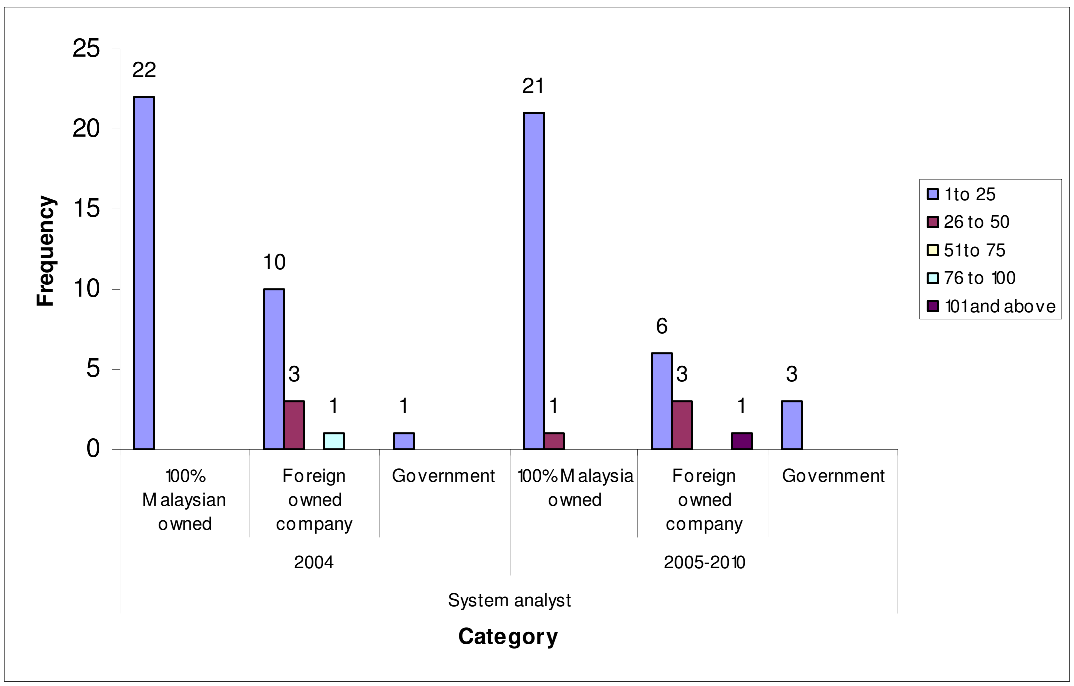

Figure 5.54: Demands for system analysts according to ownership in company's

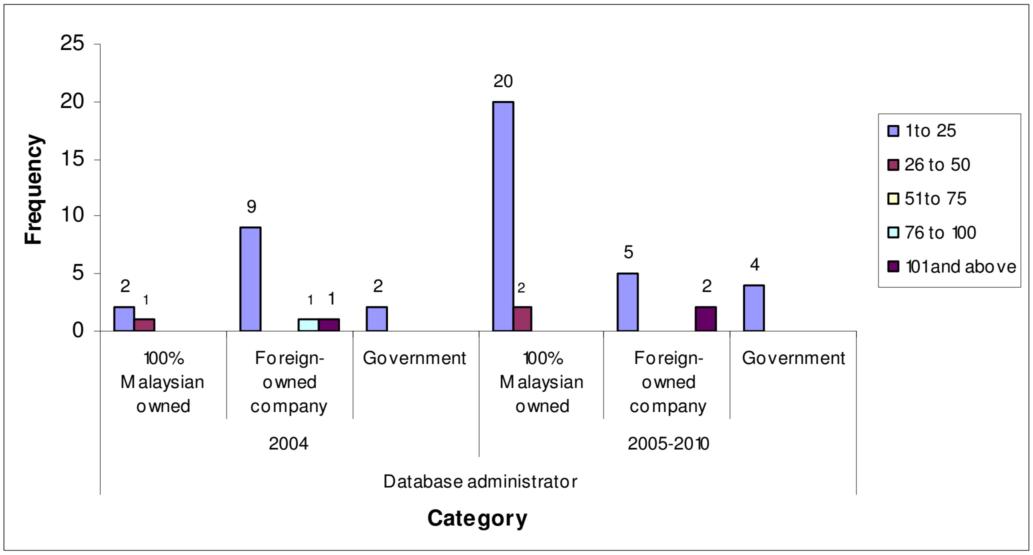

Figure 5.55: Demands for database administrators according to ownership in company's

The requirement for desktop publishing specialists appear to be slightly increased for Malaysian owned companies, but it was the opposite for foreign owned companies. Fig. 5.56 shows the demands for desktop publishing specialists according to ownership of companies.

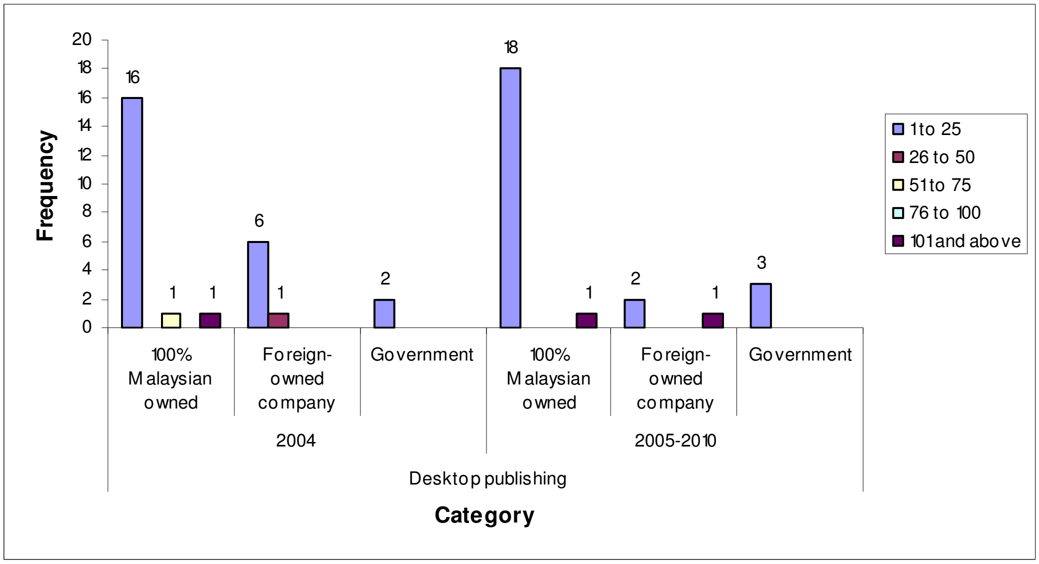

Figure 5.56: Demands for desktop publishing specialists according to Ownership in company's

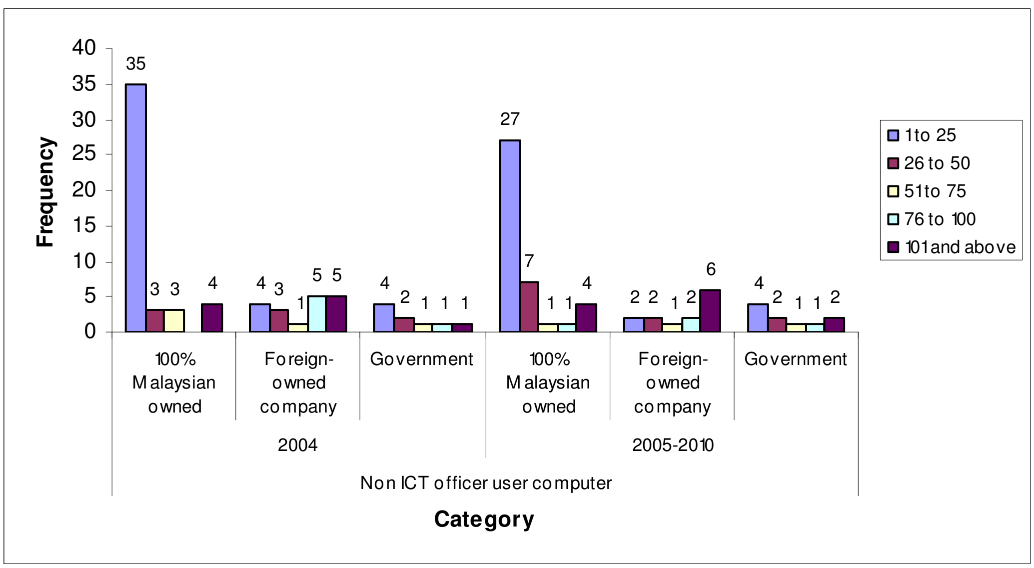

Figure 5.57: Demands for non ICT end-users according to ownership in company's

Fig. 5.57 shows the trend in end-user computing for Malaysian and foreign owed companies. As can be seen, the demands for end-user computing in Malaysian owned companies are on the downtrend. For foreign owned companies, the demand appears to be the same.

5.6 The West Coast with the Workforces in company

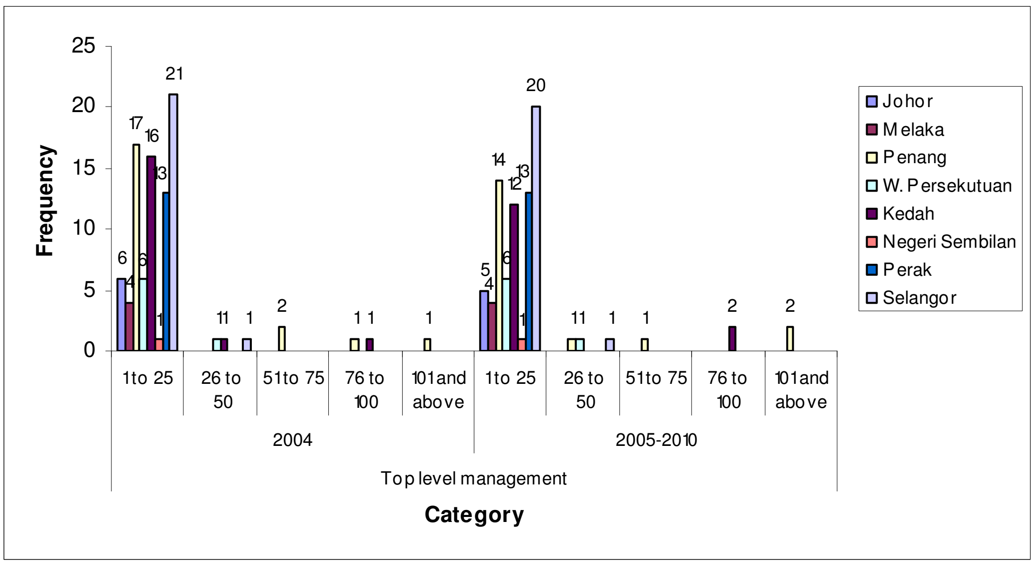

Figure 5.58: Top level management in company's in west coast

The states in the west coast, as used in this study, comprised of Johor, Malacca, Negeri Sembilan, Selangor, Wilayah Persekutuan (referred to as 'W.P.' hereafter), Perak, Penang, and Kedah. The companies involved in this study would need more than 100 workers for top level management between 2004 and 2010. In 2004, a total of 16 companies required between 26 and 100 top level management staff, while one company required more than a hundred. A large number (n = 84) of these companies would need between 1 and 25 employees at the top management posts, with a similar trend to be expected in 2005-2010. The data are shown in Fig. 5.58.

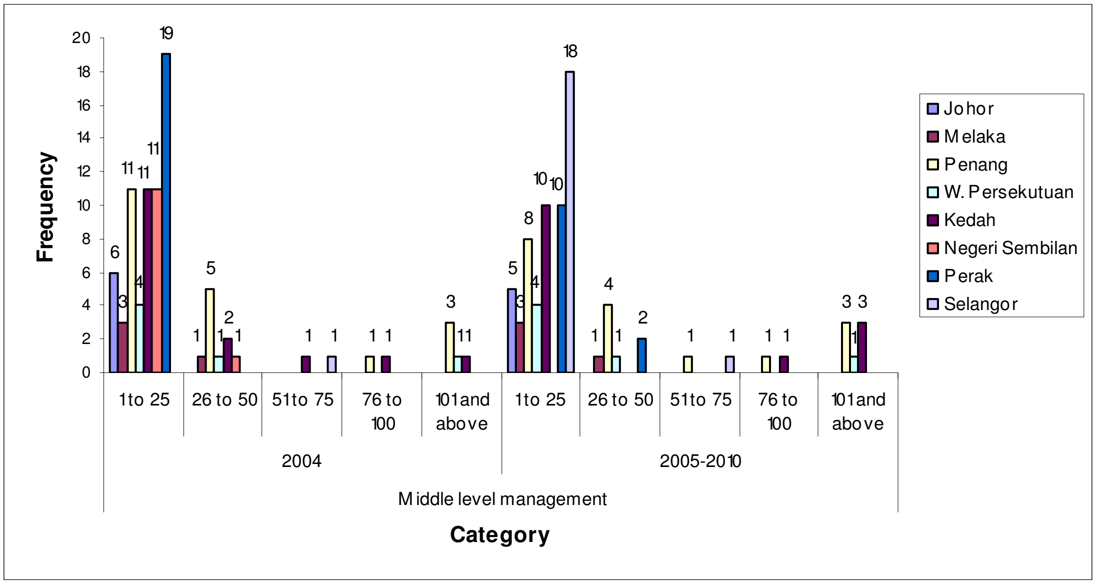

Figure 5.59: Middle level management in company's in west coast

In terms of middle level management positions, a slight increase in need could be noticed, as shown in Fig. 5.59. In 2004, five companies would require more than 100 manpower for the aforementioned positions, with an increase of two more (n = 7) between 2005 and 2010. The trend in demand for 2004 and between 2005-2010 was similar, with a range of 1 to 25 as the most sought-after number of middle level management personnel required. Others also stressed a demand of between 26 and 100 middle level management people in 2004-2010.

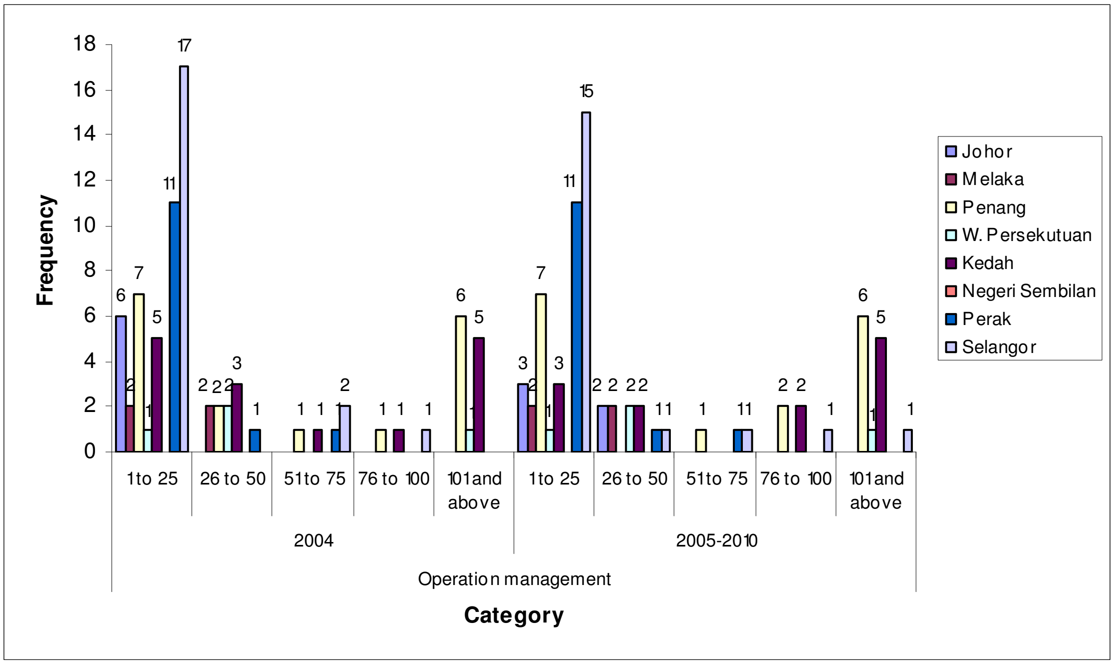

Figure 5.60: Operation management in company's in west coast

For operation management personnel, a shoot up in number is evident, as presented in Fig. 5.60. More than 10 companies would require more than a hundred staff in such category, beginning 2004 and the projected period of up to 2010. The demand by other companies in certain States varies between 26 and 100, with the bulk of the manpower to be in the range of 1 to 25.

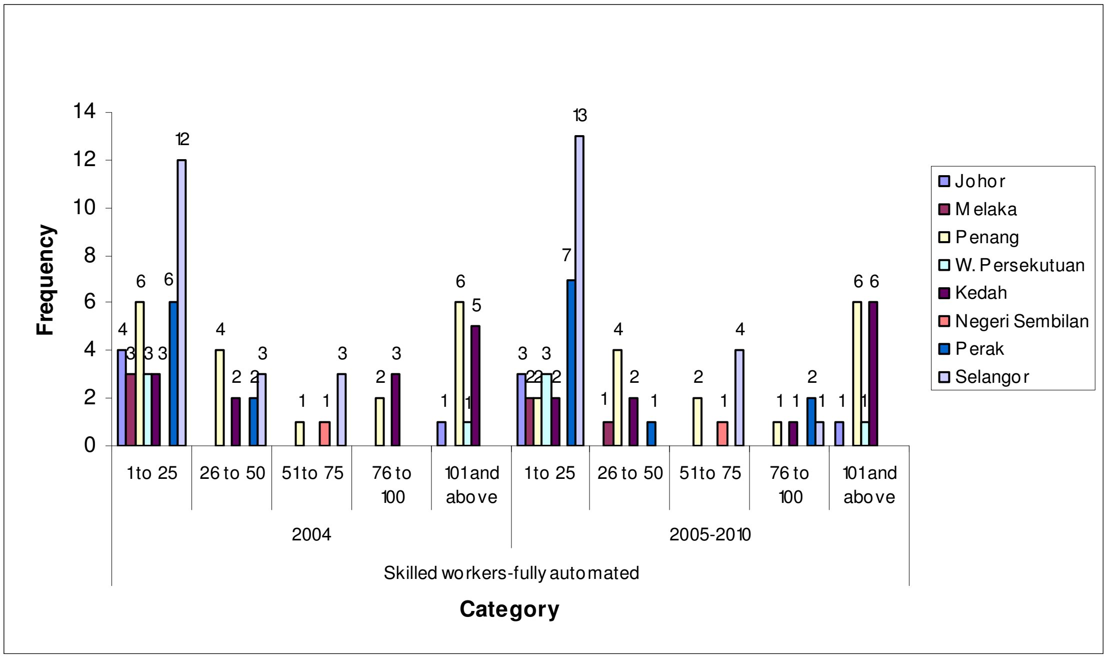

Figure 5.61: Skilled workers-fully automated in company's in west coast

The demand for skilled workers in fully automated technology was relatively substantial, beginning from 2004 up to the projected period of 2005-2010. For instance, between 2004 and 2010, 13-14 companies would require more than 100 skilled employees, while 20-21 companies indicated the need for 26 to 100 skilled workers in fully automated technology. The data are presented in Fig. 5.61.

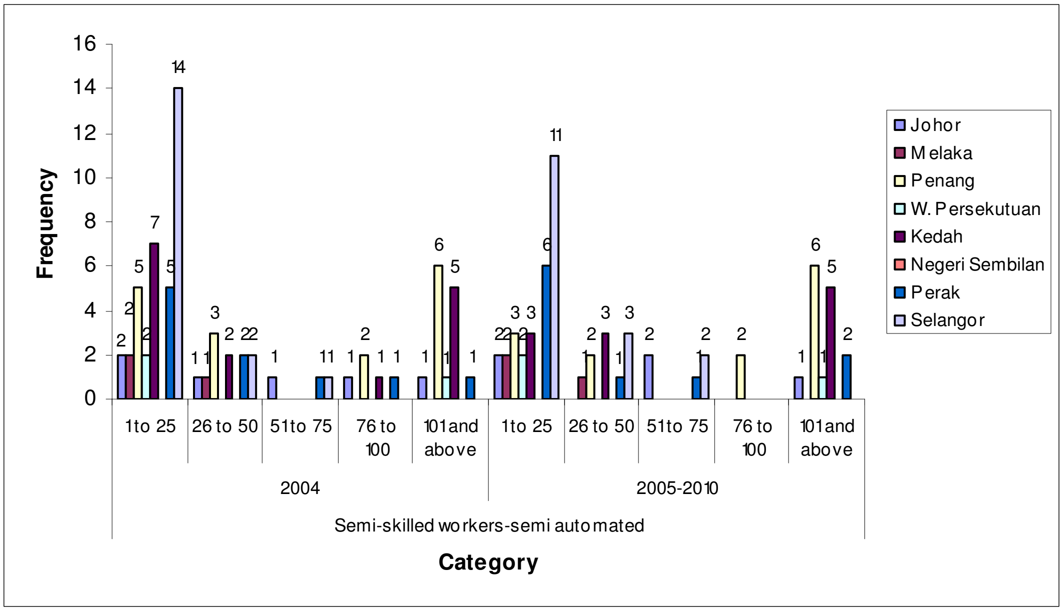

Figure 5.62: Semi-skilled workers-semi automated in company's in west coast

The need for semi-skilled workers in semi-automated technology seems considerable, with 14 companies that indicated more than 100 workers in 2004. In 2005-2010, an addition of one company (n = 15) expressed the need for such semi-skilled workers. More companies needed 76 to 100 workers with such skills in 2004 (n = 5) than in 2005-2010 (n = 2), while a relatively similar trend could be seen in terms of companies that required between 1 and 75 semi-skilled employees in semi-automated technology between 2004 and 2010. Fig. 5.62 reflects the data.

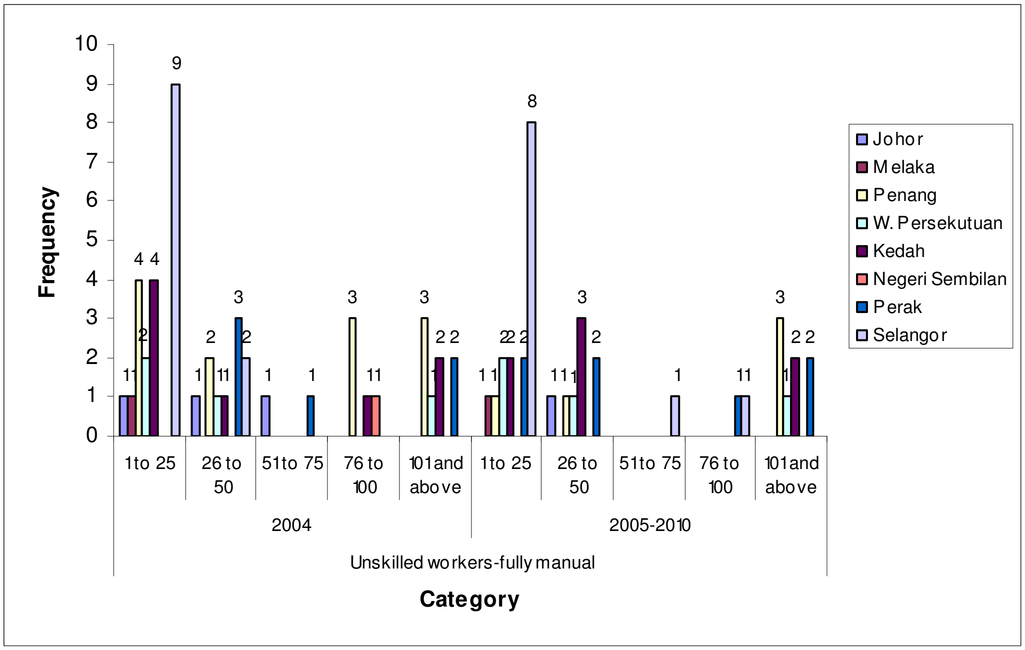

Figure 5.63: : Unskilled workers-fully manual in company's in west coast

Unskilled workers in fully manual technology were also required by certain companies in certain States. In 2004, for instance, seven companies needed more than 100 unskilled workers; 14 required 76 to 100; 12 needed 26 to 75; and the remaining 20, between 1 and 25. In 2005-2010, an addition of one company (n = 8) required more than 100 unskilled workers, three others needed between 51 and 100; eight required 26 to 50; and 16 had 1 to 25 unskilled manpower to utilize in fully manual technology. The data are shown in Fig. 5.63.

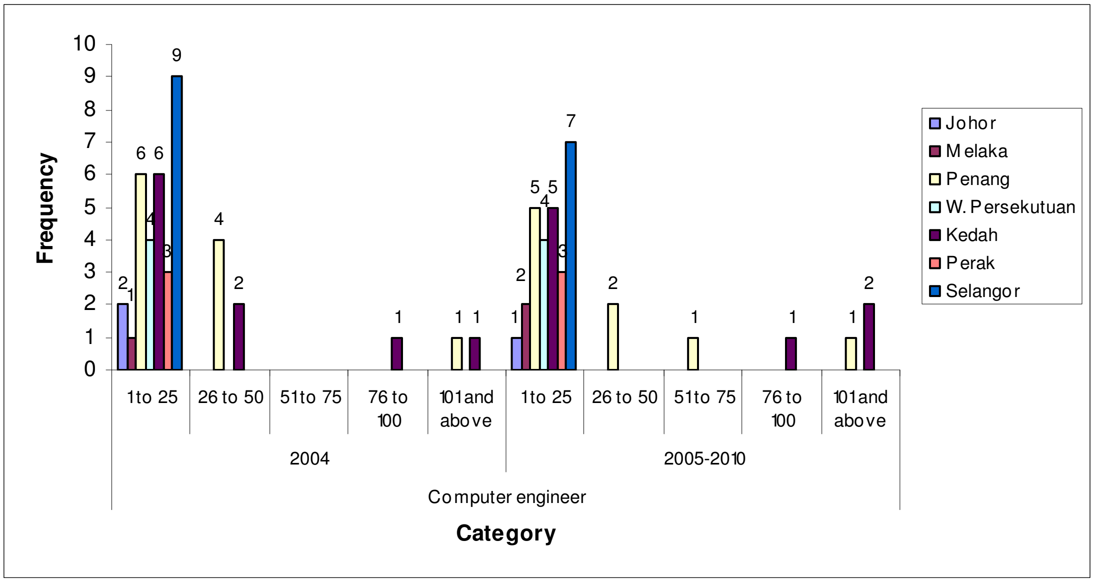

Figure 5.64: Computer engineer in company's in west coast

With regard to manpower requirements for ICT personnel (e.g., computer engineers and system analysts), a total of 40 companies needed computer engineers in 2004, while the number of companies requiring such manpower decreased to 29 (more than half) for the projected period of 2005-2010. Fig. 5.64 shows the data.

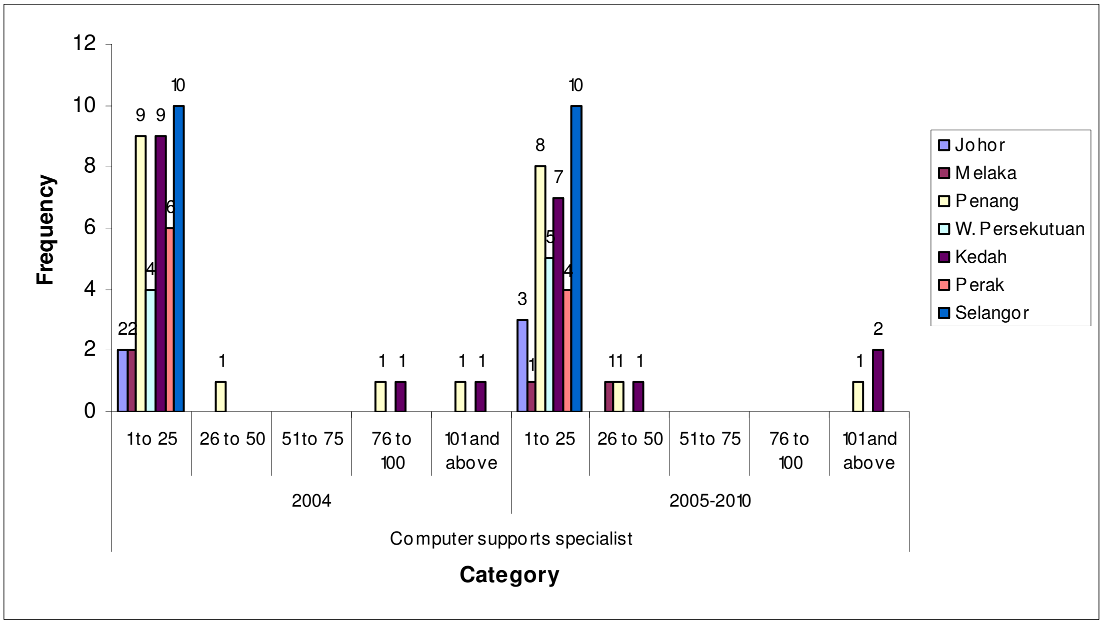

Figure 5.65: Support specialist in company's in west coast

The need for computer support specialists did not vary sharply in 2004 and in the projected period of 2005-2010. As shown in Fig. 5.65, 47 companies indicated the need for such specialists in 2004, while 44 companies anticipated the demand for such personnel between 2005 and 2010. Regardless of the period, most of the companies included in this study estimated between 1 and 25 computer support specialists.

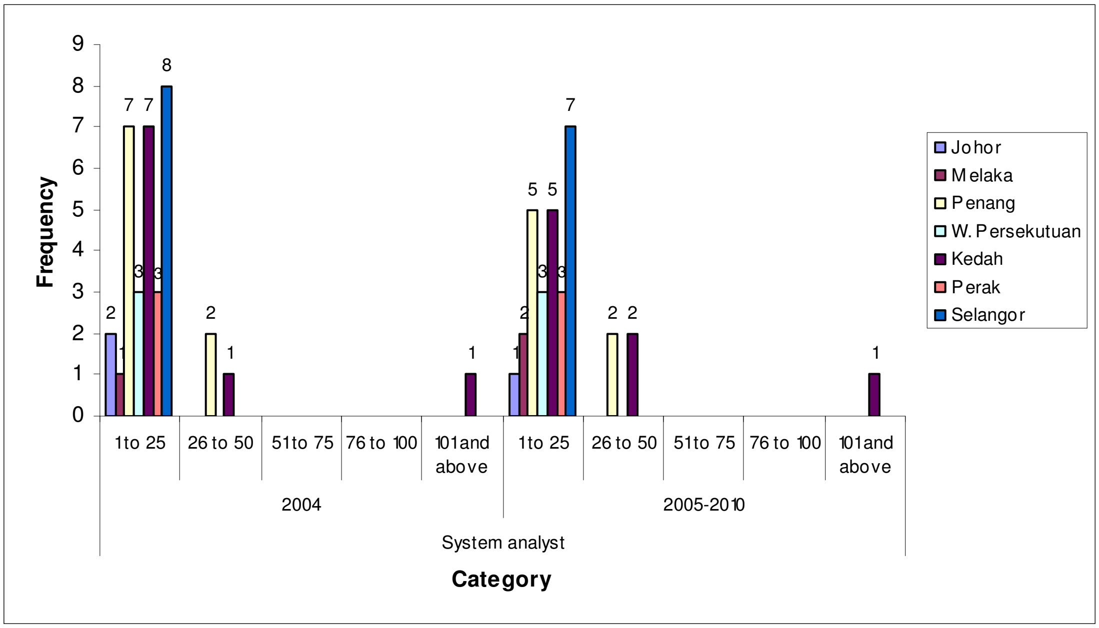

Figure 5.66: System analyst in company's in west coast

Fig. 5.66 shows that a total of 35 companies required system analysts in 2004, while there were 31 companies that expected such personnel in the workplace between 2005 and 2010. A company in Kedah required more than 100 system analysts between 2004 and 2010, while the others needed not more than 50 system analysts.

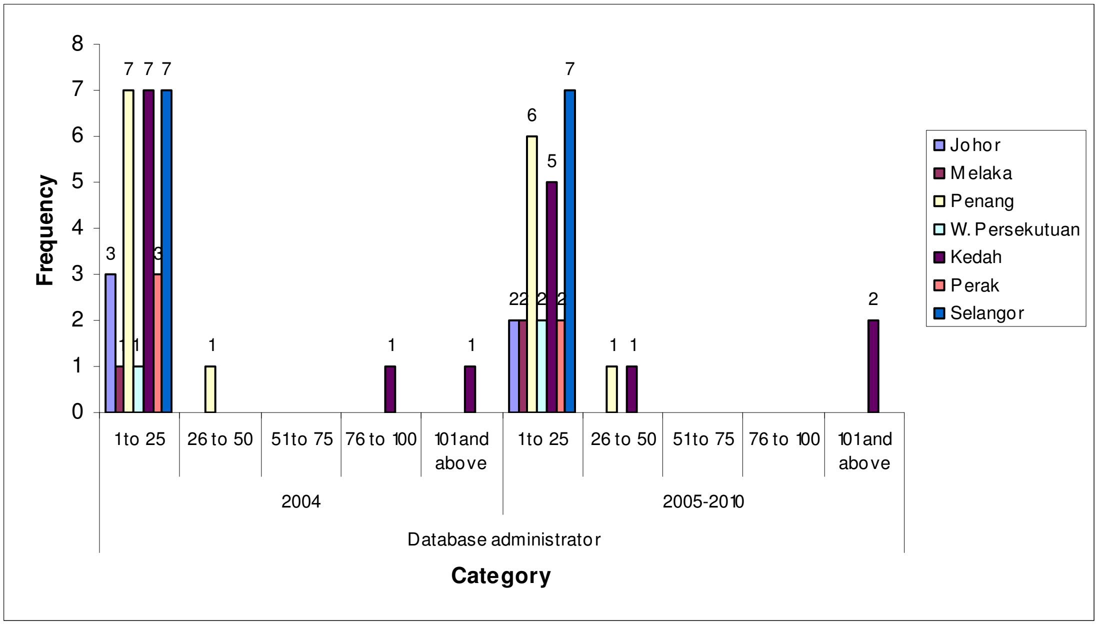

Figure 5.67: Database administrator in company's in west coast

Thirty-three companies indicated the need for database administrators in 2004, while 30 companies would need such workers in 2005-2010. Kedah-based companies would need at least 76 database administrators for 2004, while the figure increased to more than 100 for 2005-2010. The bulk of the responses was to have between 1 and 25 database administrators. Fig. 5.67 shows the results.

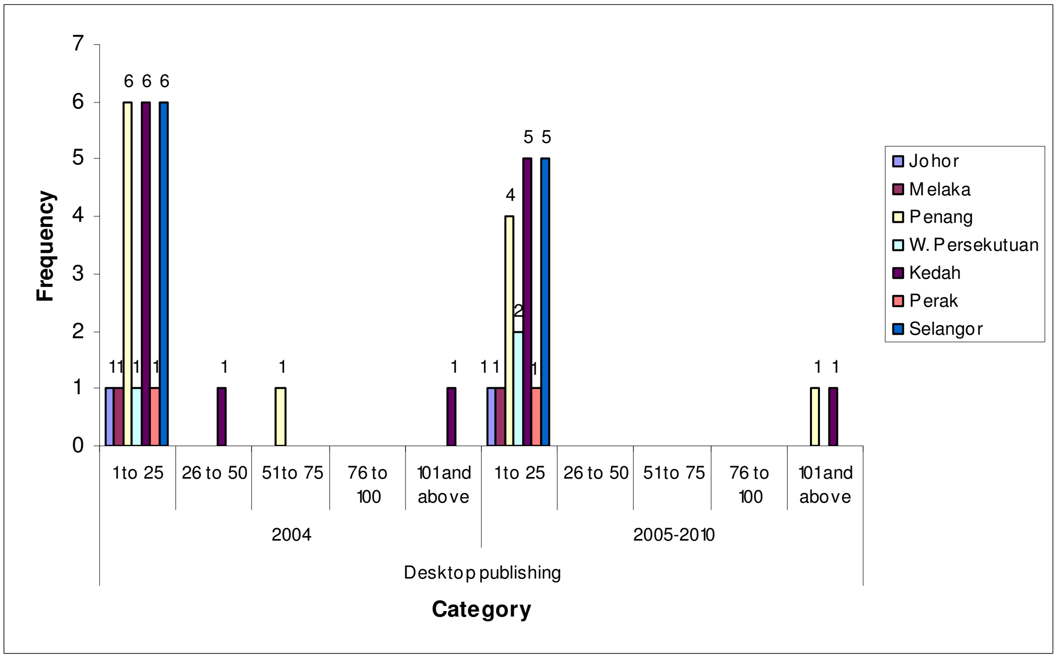

Figure 5.68: Desktop publishing in company's in west coast

A total of 25 companies would need desktop publishing workers in 2004, while only 19 would require such manpower for the projected period of 2005-2010. Only two or three companies would need at least 26 desktop publishing employees from 2004 up to 2010, while many of them estimated 1 to 25 such employees. The data are shown in Fig. 5.68.

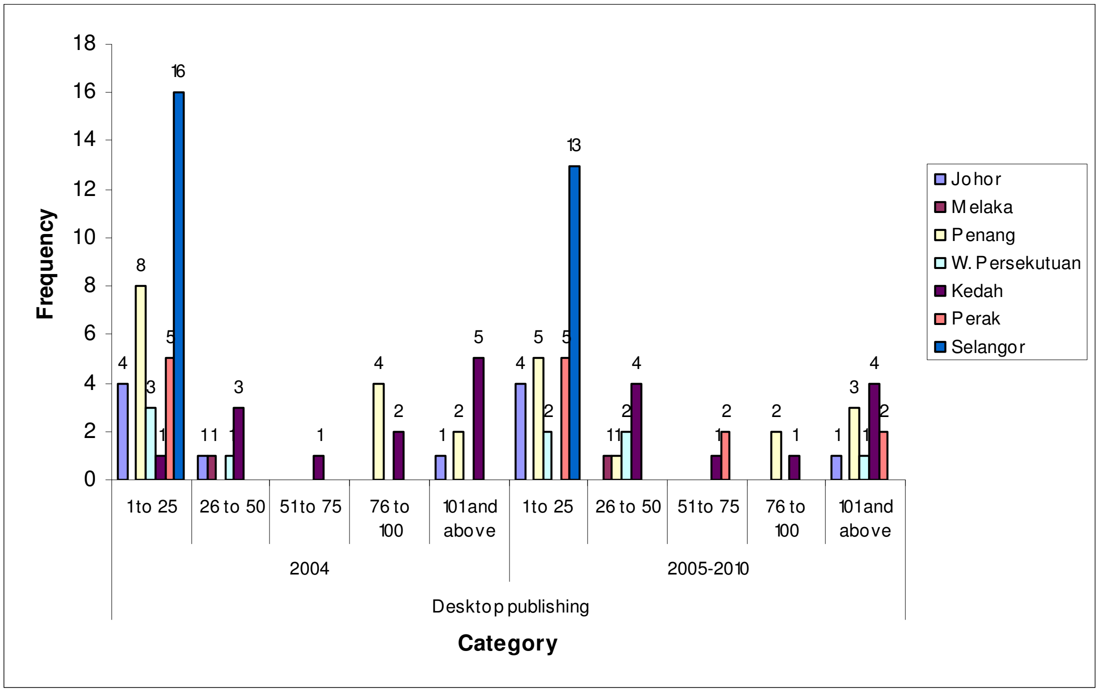

Figure 5.69: Non officer user computer in company's in west coast

Interestingly, a number of companies had non-ICT officers who used computers in their daily operations. As shown in Fig. 5.69, a total of 56 companies had such officers as of 2004. The projected period (2005-2010) saw a modest increase (n = 63) in the need, with 11 companies estimating more than 100 workers in 2005-2010.

5.7 The West Coast with the Information and Communication Technology (ICT) Adoption

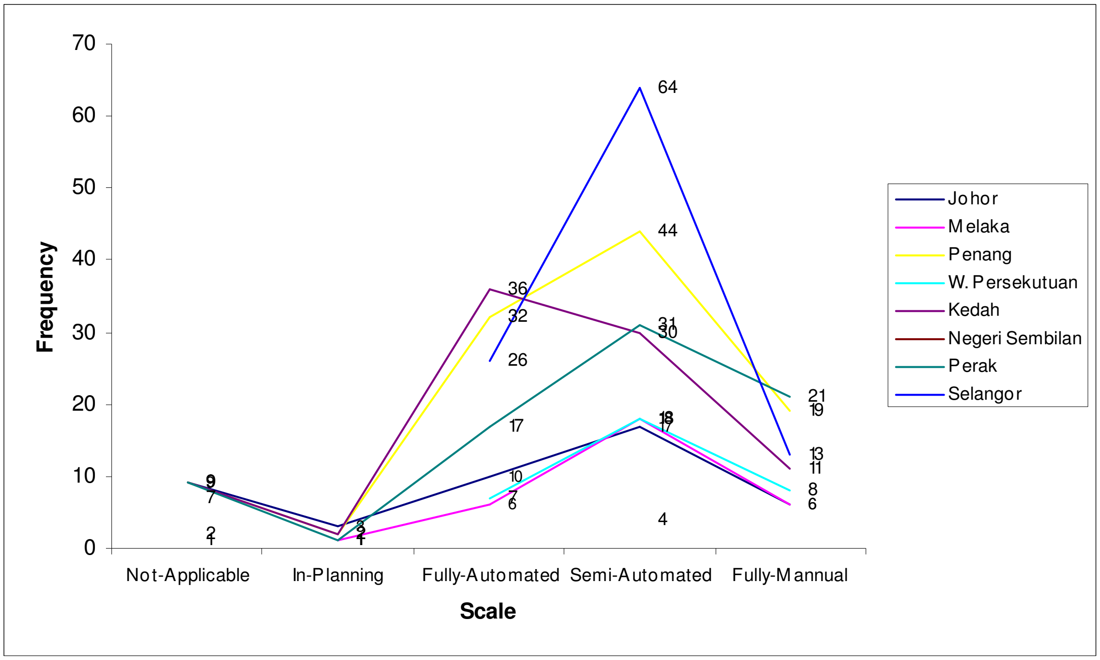

Figure 5.70: ICT adoption in administration in west coast

Adoption of ICT in the workplace was also explored, specifically in terms of administration and operations. As shown in Fig. 5.70, more than 200 (n = 208) of the companies surveyed utilized ICT in administration-related work like purchasing, tender, and bookkeeping, among others. More than a hundred (n = 134) were fully automated, while 78 were fully manual. Seven companies were still in the planning process of ICT adoption in administrative work, while 18 said it was 'not applicable'.

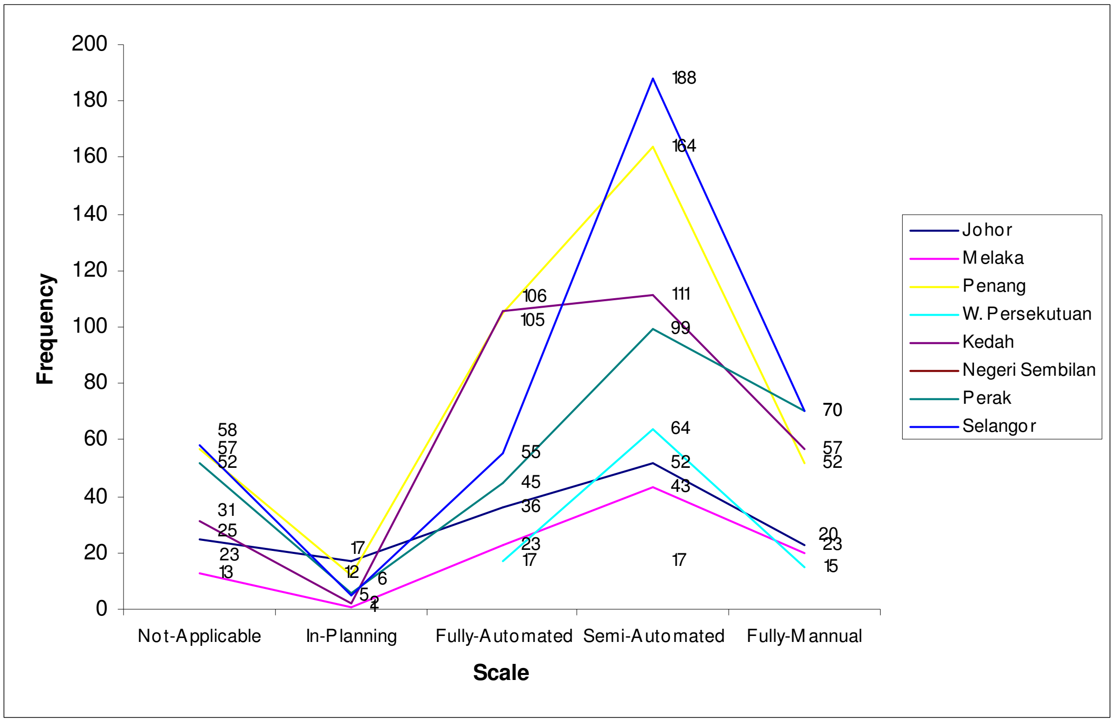

Figure 5.71: ICT adoption in operations west coast

Apparently, ICT was highly adopted in operational work, such as material control, scheduling, selling, and product development, to name a few. Fig. 5.71 shows that more than 700 (n = 738) of the companies in the west coast utilized semi-automated technology for operations-related jobs, while close to 400 (n = 387) were fully automated. More than 200 (n = 237) were fully manual, 42 said they were in the planning phase of such ICT adoption, and 259 said it was 'not applicable' in their working environment.

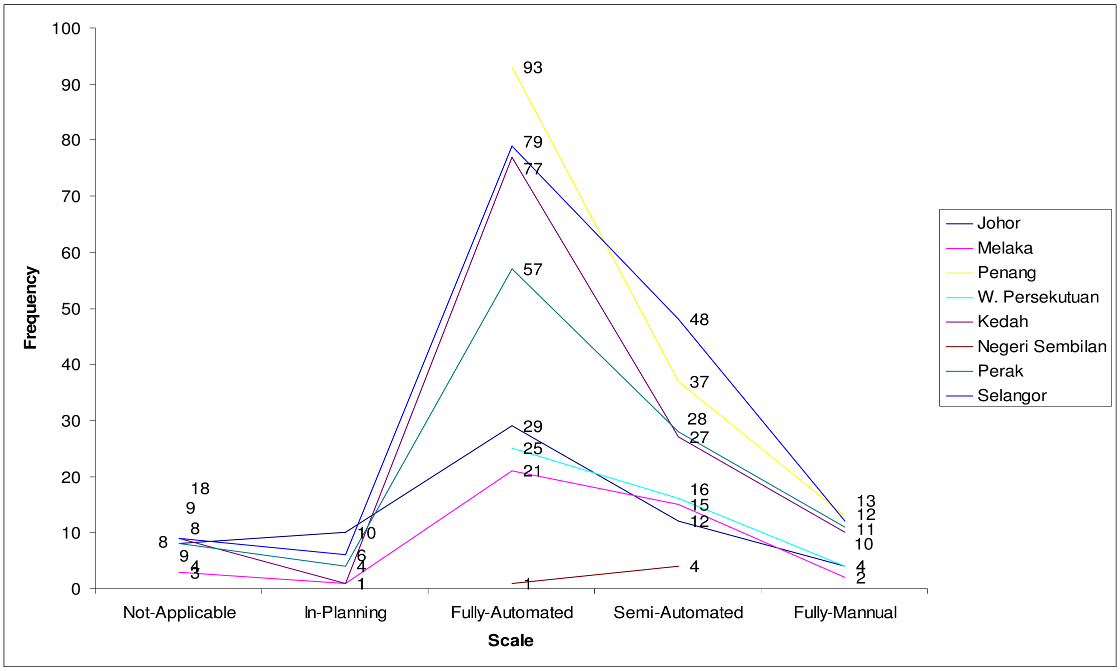

Figure 5.72: Usage of software ICT adoption in west coast

Close to 400 (n = 382) companies were fully automated in their ICT software adoption, while nearly 200 (n = 172) were semi-automated; 52 companies said they utilized fully manual technology, and 21 were planning for software usage. Fifty-nine responded that such usage was not applicable in their work environment. Fig. 5.72 presents the data.

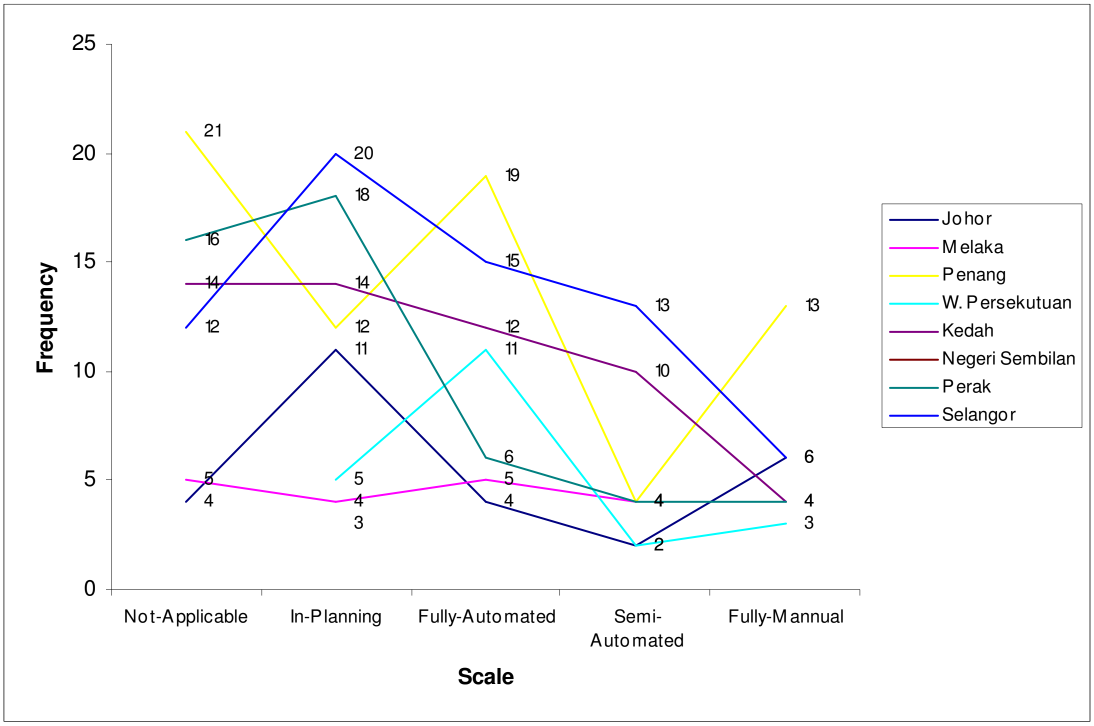

Figure 5.73: Types of business ICT adoption in west coast

Fig. 5.73 presents the findings on the types of business in ICT adoption in the west coast-located companies. As observed, twenty-six companies were fully manual, while 29 were semi-automated. Although 72 companies indicated fully automated technology, 87 were still in the planning stage. Likewise, 69 mentioned that it was applicable in their business context.

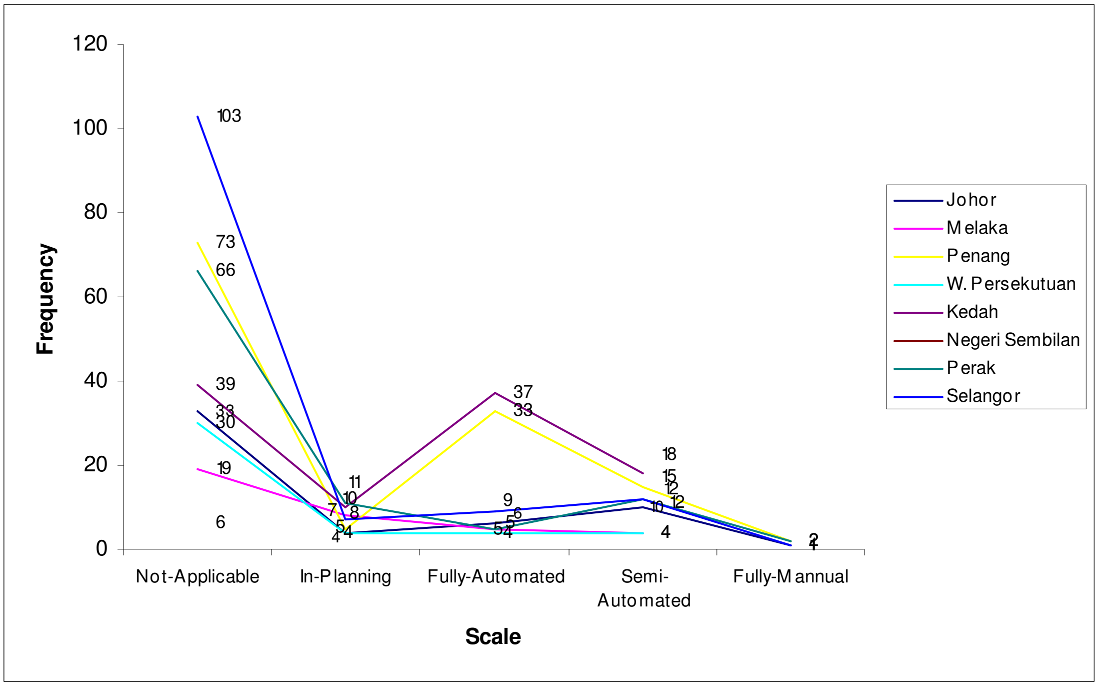

Figure 5.74: Stand-alone technology in ICT in west coast

The adoption of stand-alone, intermediate, and integrated technology among companies in the west coast was also explored. As shown in Fig. 5.74, a large number (n = 369) of the respondents did not find stand-alone technology (such as computer-aided technology and material working laser) applicable in their business operations. Almost a hundred (n = 99) of them were full automated, 71 were semi-automated, and the remainder (n = 6) utilized fully manual technology. About fifty (n = 49) of the companies were in the planning process in terms of stand-alone technology adoption.

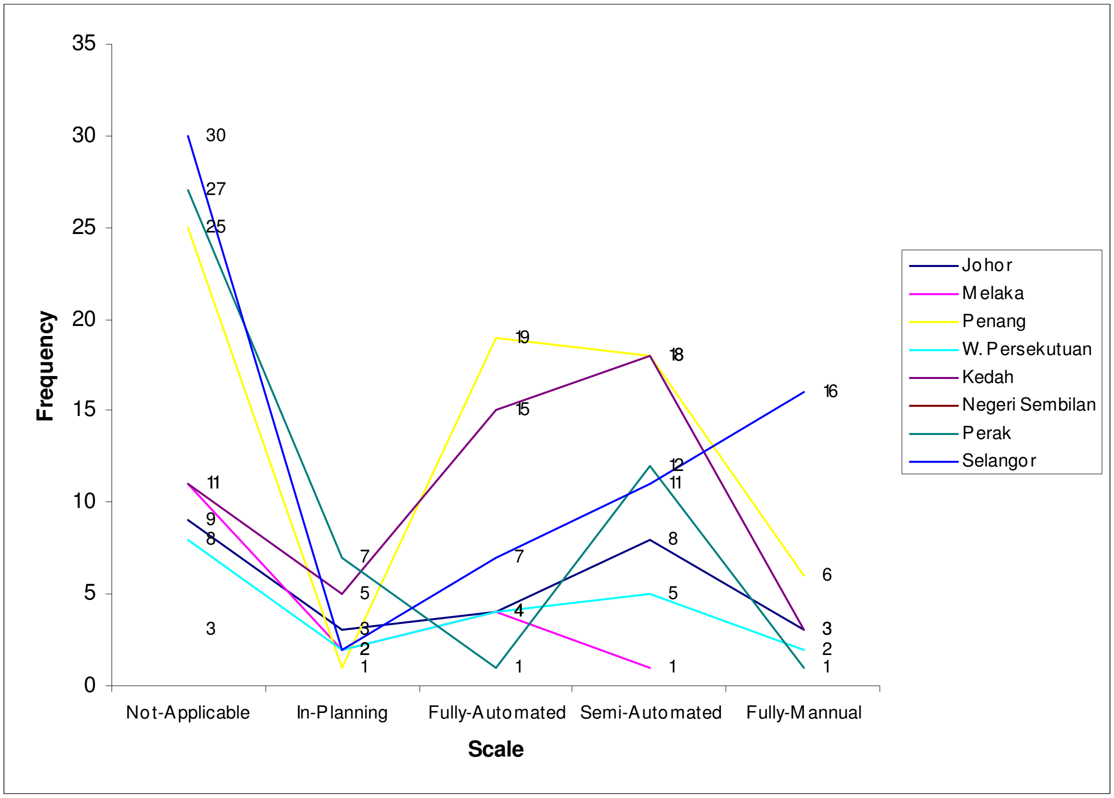

Figure 5.75: Intermediate ICT adoption in west coast

With regard to the adoption of intermediate technology in the west coast, about fifty (n = 46) were full automated, 55 were semi automated, and 28 were full manual. Eighteen companies were in the planning stage, while more than a hundred (n = 113) responded ‘not applicable’. Fig. 5.75 presents the data.

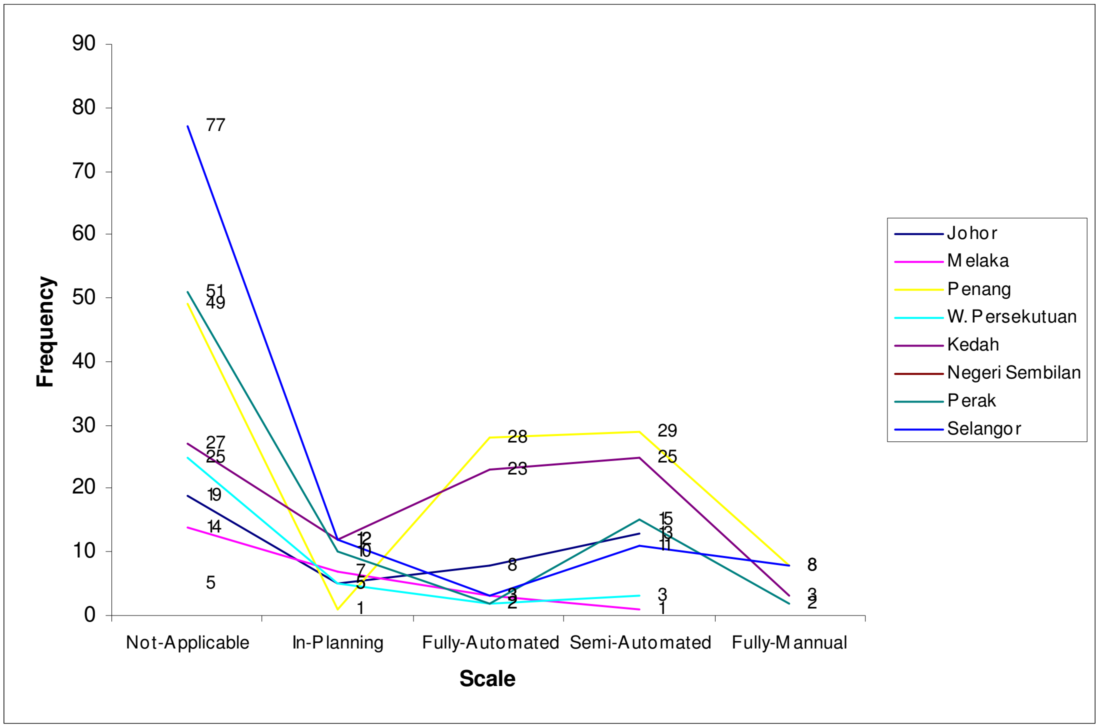

Figure 6.76: Integrated technology ICT adoption in west coast

Adoption of integrated ICT technology was also not in full swing yet, as shown by 267 companies which said that this was 'not applicable' in their organizations. Thirty-five companies were 'in-planning' for it, while 52 companies were fully automated. About a hundred (n = 97) were semi-automated, while 13 were fully manual. Fig. 5.76 shows the data.

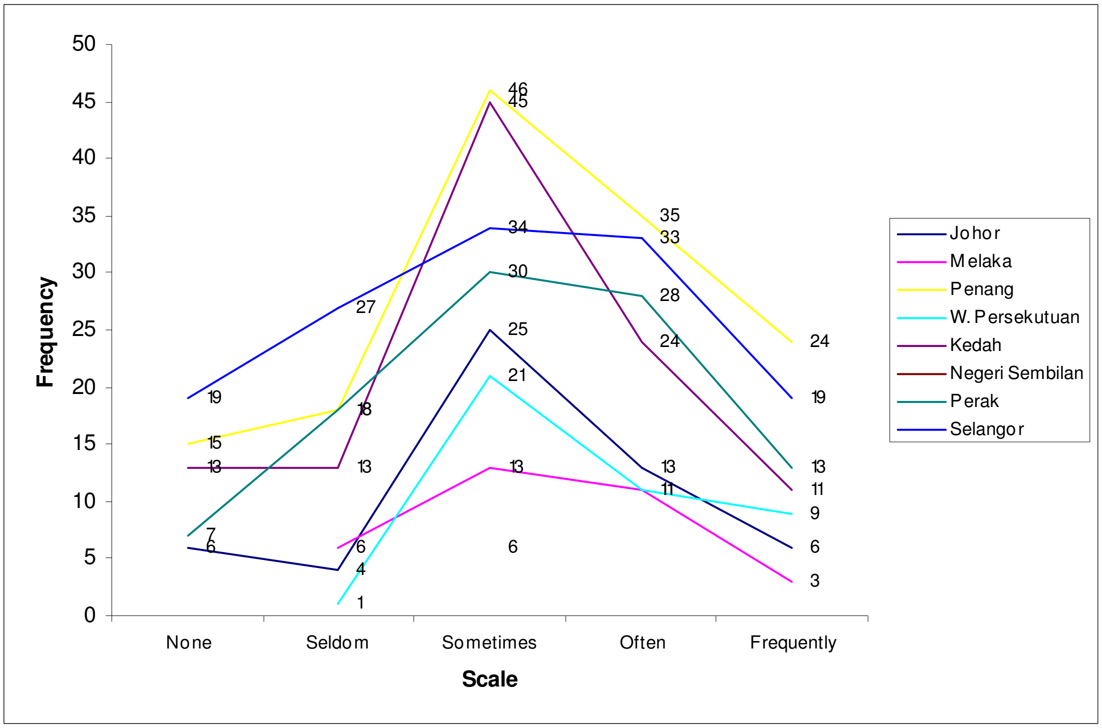

Figure 5.77: Administration training in west coast

Related training programs were conducted by the companies involved in the research to accommodate the demands and challenges of technology adoption. One of these is training on administration. As shown in Fig. 5.77, more than 500 (n = 518) of the companies provided training programs on administration, the frequency of which ranged between 'frequently' and 'seldom'. Specifically, 85 companies did provide 'frequently' administration-related training on ICT, 144 had it 'often', 69 said they did it 'seldom', while more than two hundred (n = 220) provide this type of training 'sometimes'. Sixty companies did not provide such training at all.

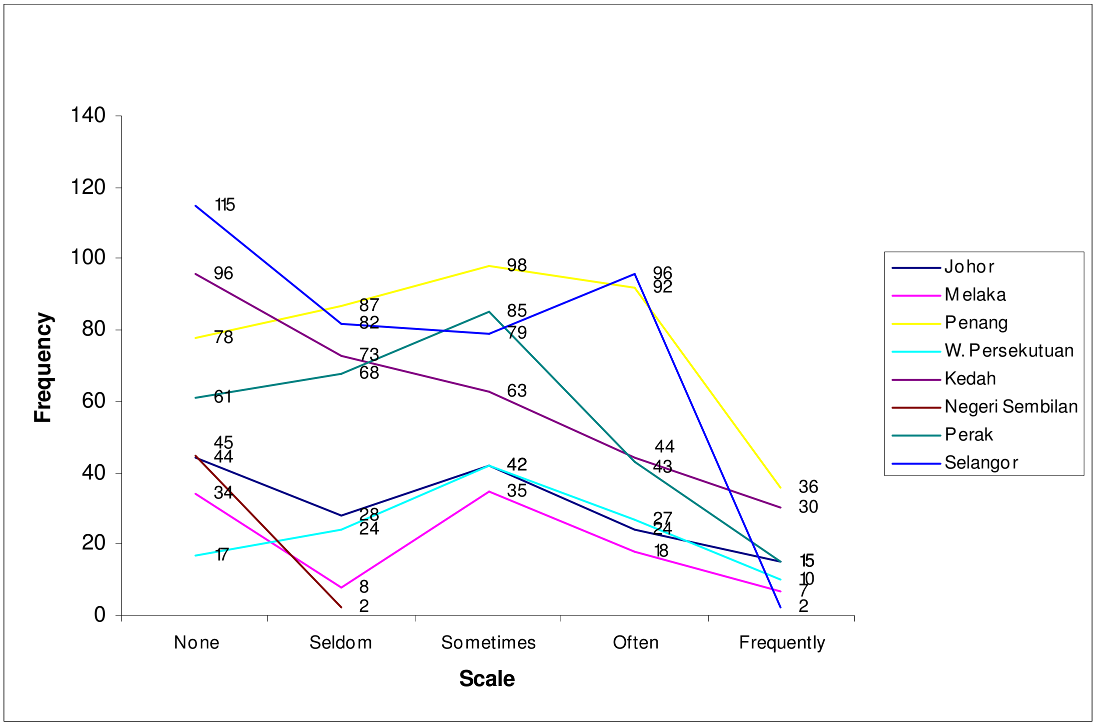

Figure 5.78: Operations training in west coast

In terms of operations training, more than a thousand (n = 1220) companies did provided some form of training to their workers, such as those that relate to material control, supplies, and engineering, among others. Specifically, Fig. 5.78 shows that 102 companies provided such training ‘frequently’, 344 ‘often’, 402 ‘sometimes’, and 372 ‘seldom’. A large number (n = 490) of companies said they had no provision for operations training.

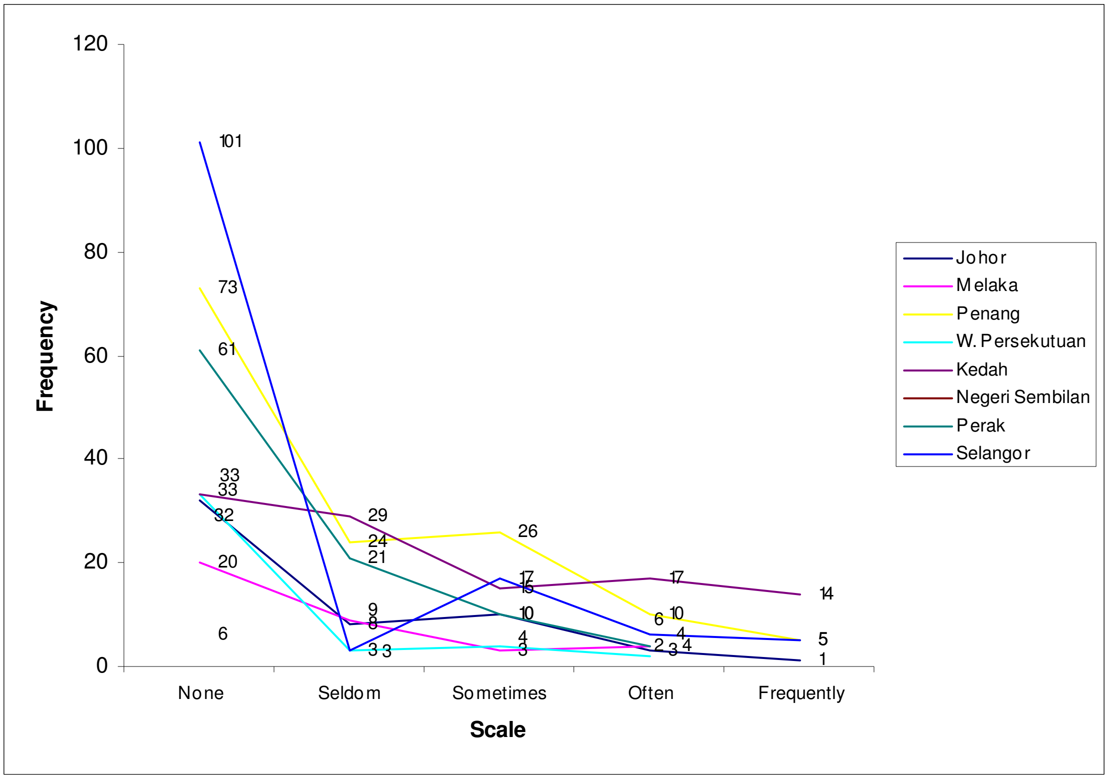

Figure 5.79: Stand-alone technology training in west coast

Training programs on operations technology for stand-alone, intermediate, and integrated technologies were also explored in this study. As Fig. 5.79 suggests, a total of 239 companies had stand-alone technology training. Of this number, 20 companies have conducted such training 'frequently', 46 'often', 76 'sometimes', and '97 'seldom'. More than 300 (n = 326) companies had no such training at all.

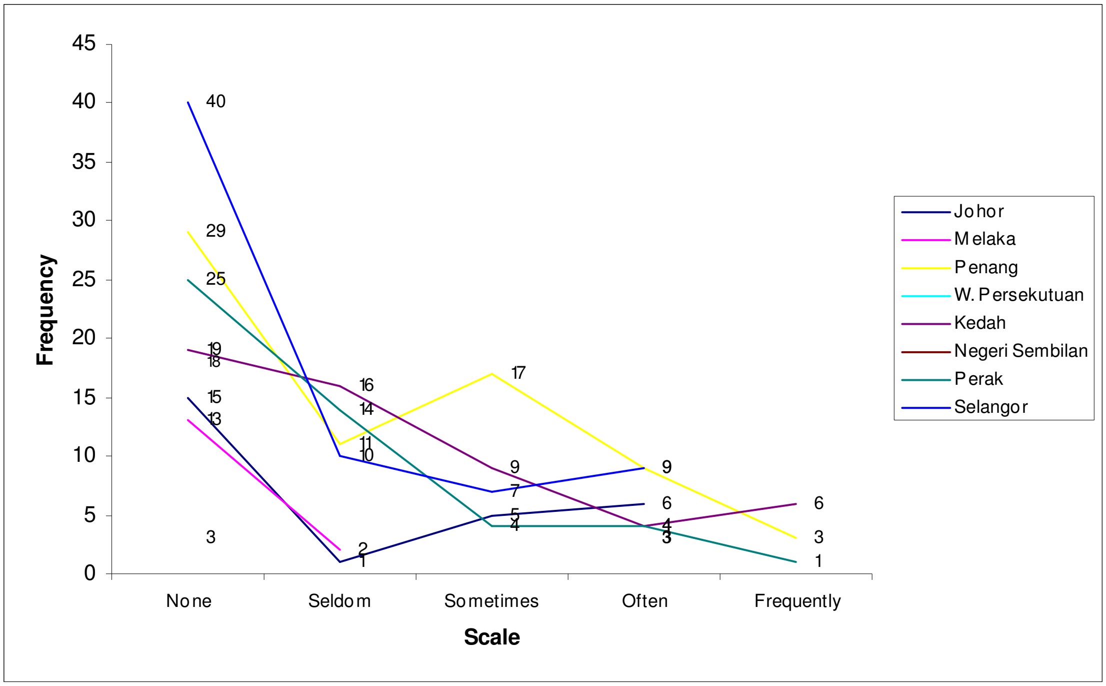

Figure 5.80: Intermediate technology training in west coast

With regard to intermediate technology training, 127 companies had provided such training to their employees. Of this total, 10 had it ‘frequently’, 22 conducted programs ‘often’, 42 said they had such training ‘sometimes’, and 53, ‘seldom’. Despite the number of companies that afforded intermediate technology training, there were still 162 companies that did not provide such training. Fig. 5.80 shows the data.

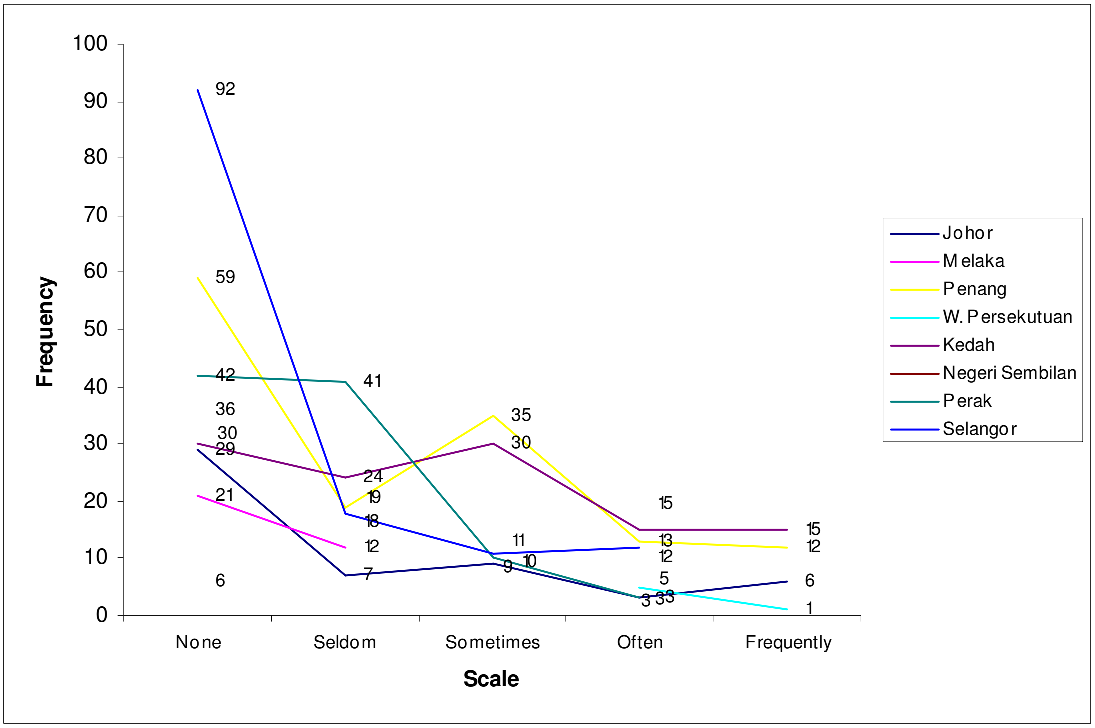

Figure 5.81: Integrated technology training in west coast

In terms of intermediate technology training, a total of 288 companies had conducted such training for their workers. Of this number, 91 companies conducted 'regularly' ('often' and 'frequently') training on intermediate technology, 95 had such training 'sometimes', and more than a hundred (n = 102) did it 'seldom'. A large number (n = 315) of these companies had not provided such training. The data are shown in Fig. 5.81.

5.8 The East Coast with the company's status have and non MSC

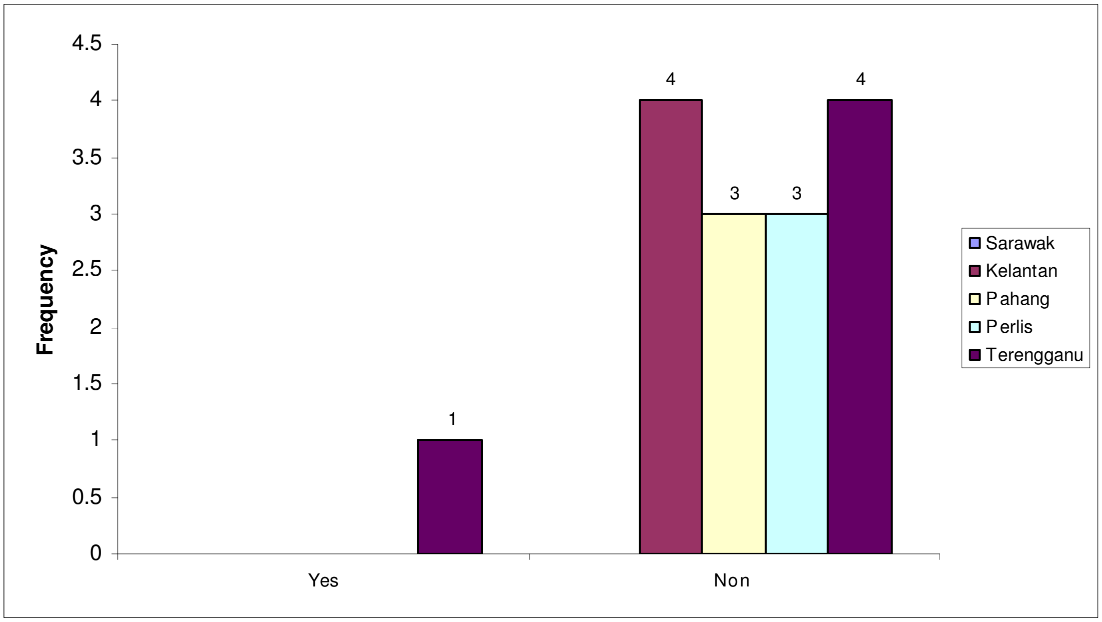

Figure 5.82: Company's status in east coast

The data in Fig. 5.82 shows that of the companies covered in this research in the states of Sarawak, Kelantan, Pahang, Perlis, and Terengganu, only one is MSC-status (in Terengganu), and the rest were not. Four non-MSC status companies that participated in this study were in Kelantan and another four in Terengganu, while Pahang and Perlis each had three non-MSC status companies that were involved in the study.

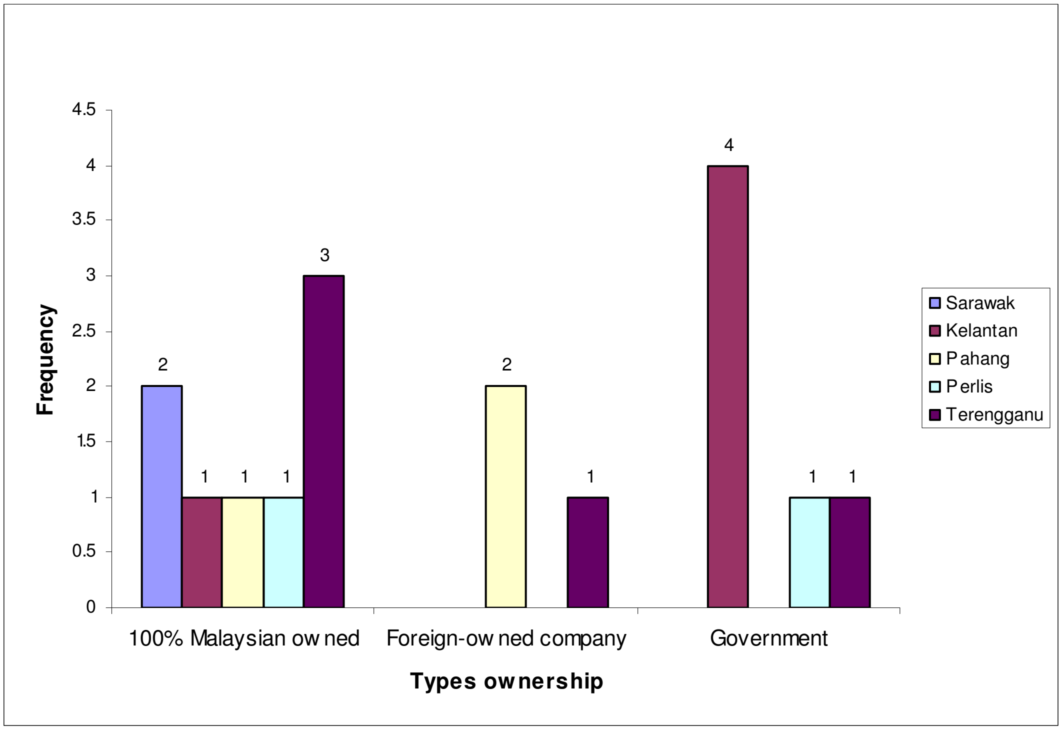

Figure 5.83: Types of ownership in east coast

In terms of ownership of the organization, Fig. 5.83 shows a combined total of eight companies in Sarawak (n = 2), Kelantan (n = 1), Pahang (n = 1), Perlis (n = 1), and Terengganu (n = 3) were 100% Malaysian-owned. There were two foreign-owned companies in Pahang that participated in the study, while another one was from Terengganu. Government organizations also took part in this research, where four of them were from Kelantan, and one each from Pahang and Terenganu.

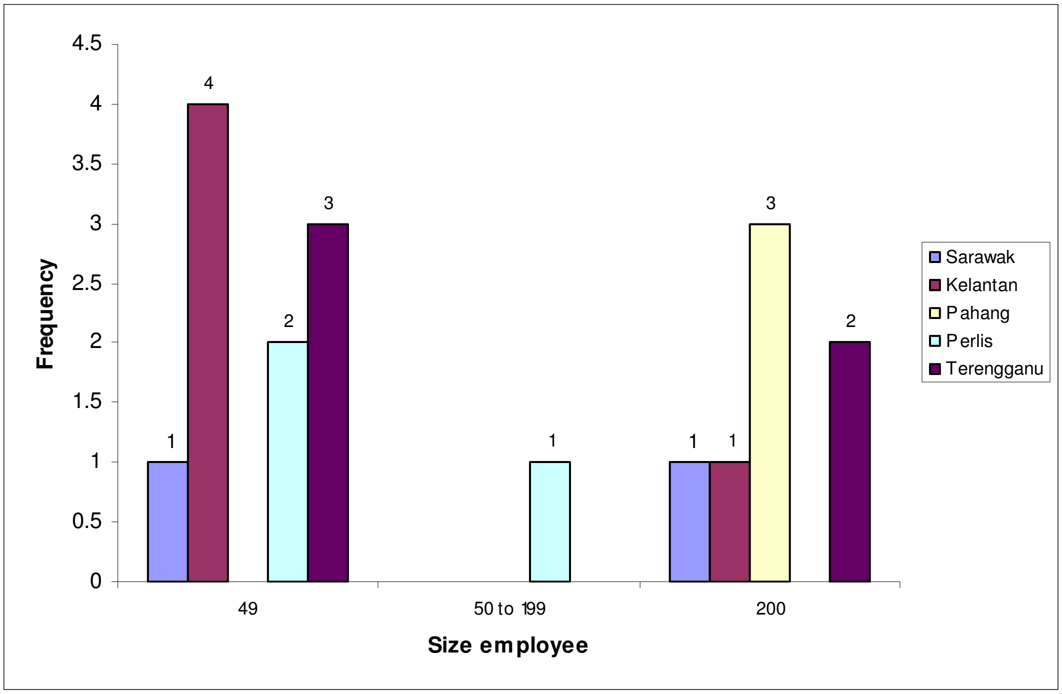

Figure 5.84: Size of employee in east coast

The companies involved in this study in the states of Pahang, Terengganu, Kelantan, and Sarawak had at least 200 employees, while one company in Perlis had a workforce size of 50-199. A total of 10 companies in Kelantan (n = 4), Terengganu (n = 3), Pahang (n = 2), and Sarawak (n = 1) had '49 and below' employees. Fig. 5.84 shows the data.

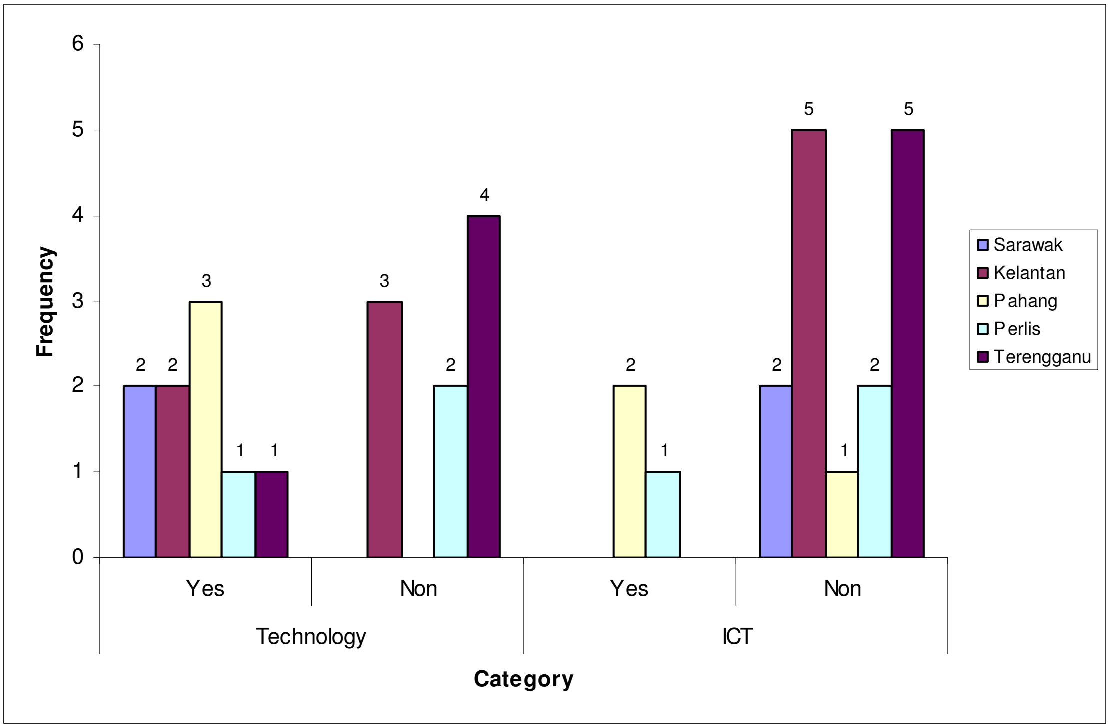

Figure 5.85: Company's status has and Non ICT and Technology in east coast

Whether the companies in this research have enough skilled workers in technology apart from ICT was also examined. Findings in Fig. 5.85 revealed nine companies having technology-oriented workers, while three had ICT-oriented employees. The former were from Pahang (n = 3), Kelantan (n = 2), Sarawak (n = 2), Perlis (n = 1), and Terengganu (n = 1), while the latter were from Pahang (n = 2) and Perlis (n = 1).

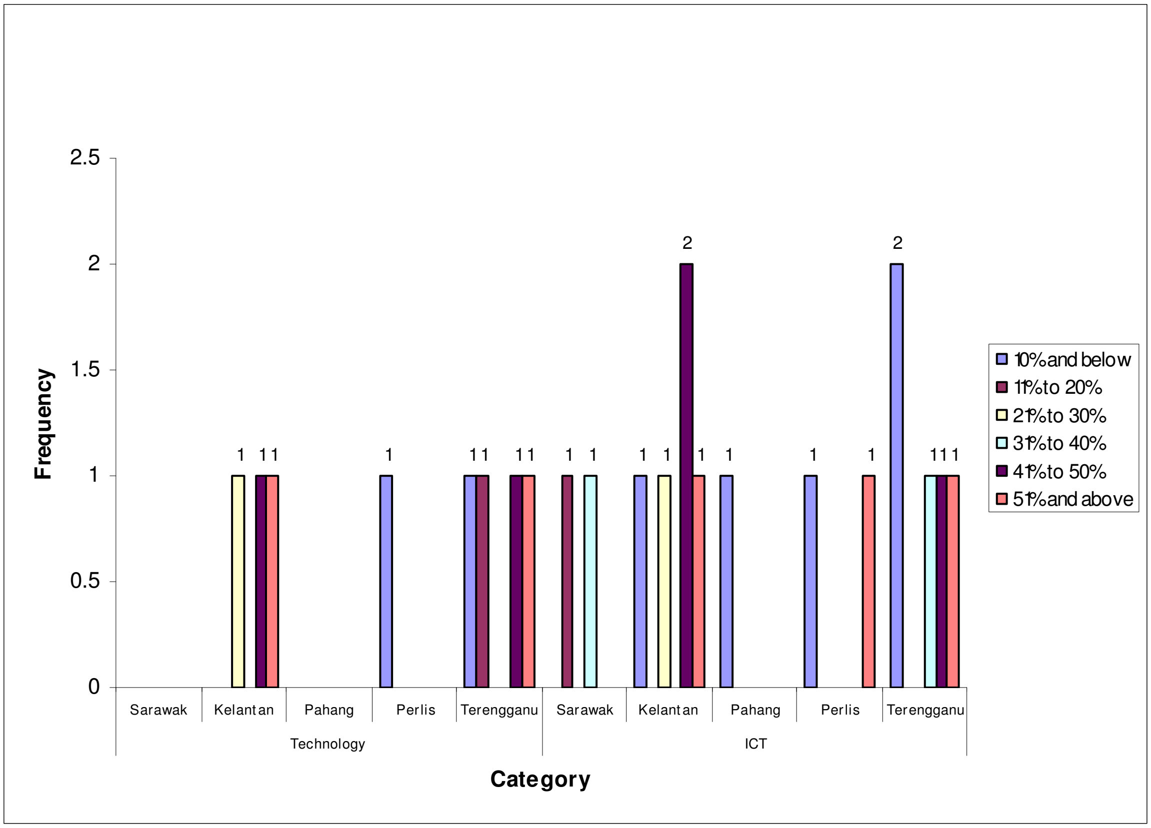

Figure 5.86: Technology and ICT in company in east coast

The researchers explored the required percentage of technology and ICT workers in the companies involved. As shown in Fig. 5.86, two companies each in Kelantan and in Terengganu required 41-50% employees with ICT skills, while the rest of them required at least 10% of neither ICT nor technology-skilled workers.

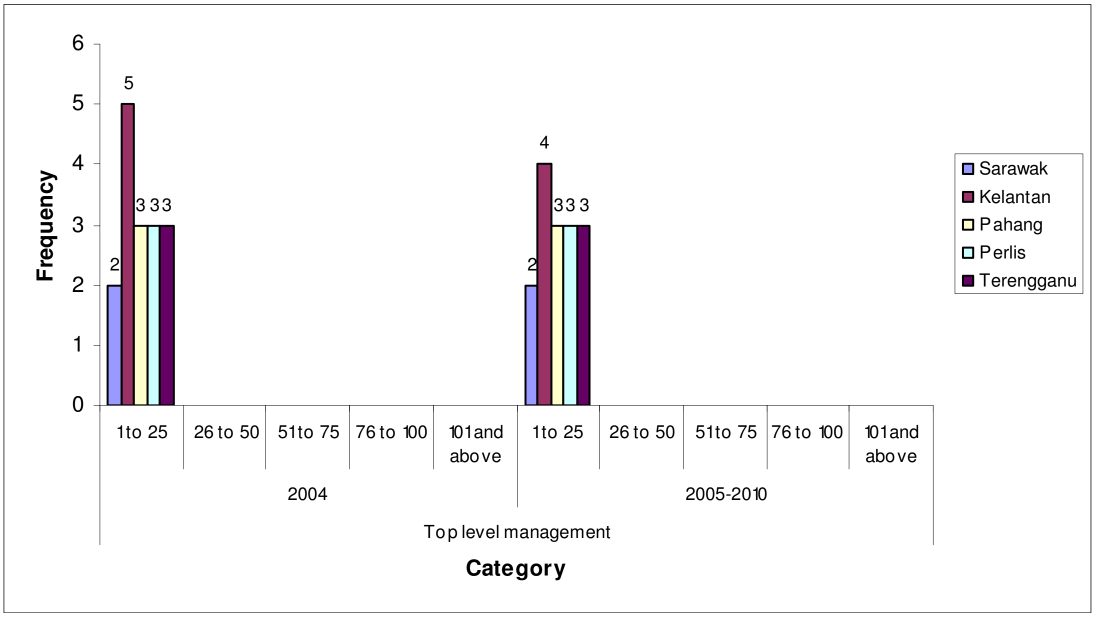

Figure 5.87: Top level management in east coast

In terms of the approximate number of workforce in the top management level, Fig. 5.87 shows that 16 companies had '1 to 25' top management-level employees for 2004, with the same number projected in 2005-2010.

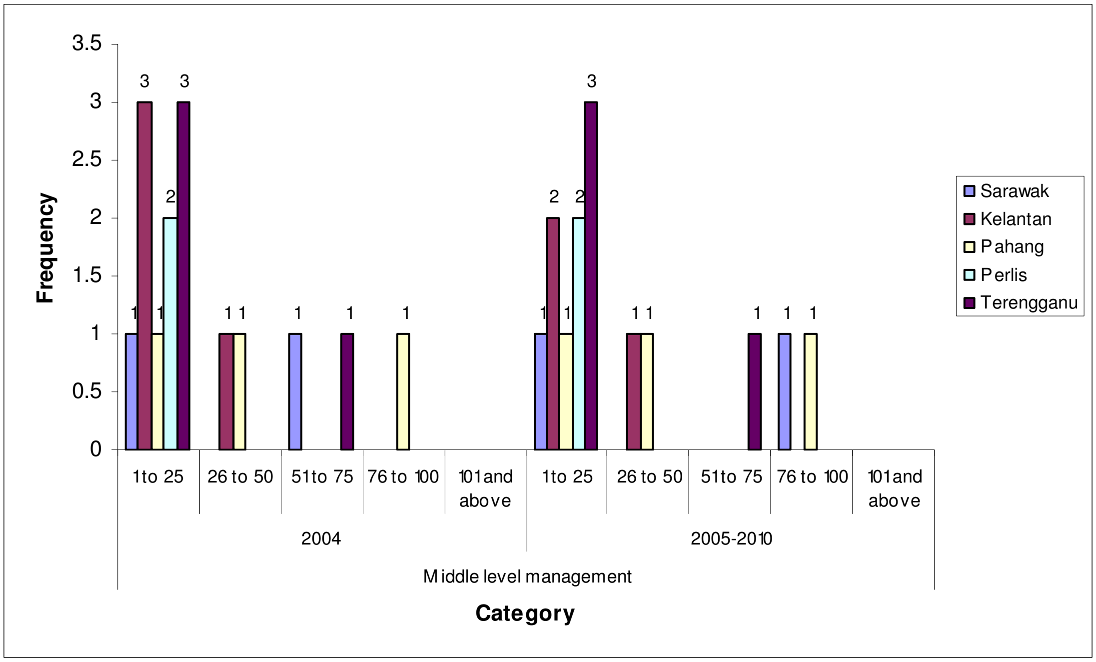

Figure 5.88: Middle level management in east coast

The requirements for middle-level management workers, however, were more compared to those for top management positions. Fig. 5.88 suggests that up to 100 middle managers were needed between 2004 and 2010. In 2004, one company in Pahang required 76 to 100 middle-level management staff, another in Terengganu and in Sarawak required 51 to 75 such workers, and also one each in Kelantan and Perlis that needed 26 to 50 middle-level management workers. Ten others in these States covered required 1 to 25. For 2005-2010, one company each in Pahang and Sarawak projected 76 to 100 workers in middle management, another in Terengganu with 51 to 75, and Perlis and Kelantan with 26 to 50. Some companies in all these States also projected 1 to 25 middle-level management workforce.

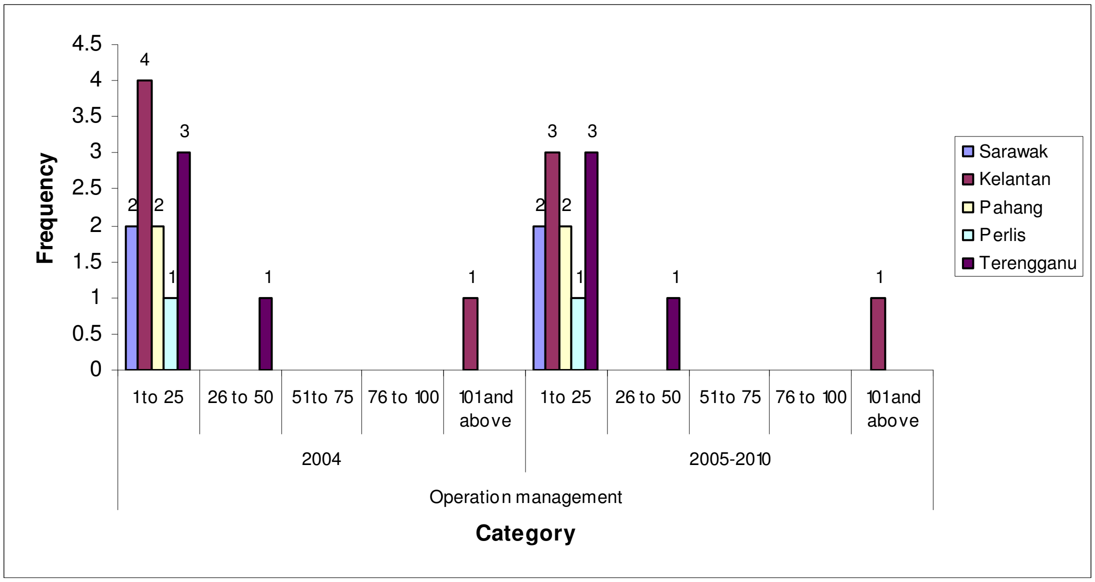

Figure 5.89: Operation management in east coast

In terms of staff managing business operations, Fig. 5.89 shows that in 2004, at least 101 workers were needed by one company in Kelantan, another 26 to 50 human resources required by one company in Terengganu, and between 1 and 25 workforce required by 12 companies in Kelantan (n = 4), Terengganu (n = 3), Sarawak (n = 2), Pahang (n = 2), and Perlis (n = 1). A highly similar trend could also be expected in 2005-2010.

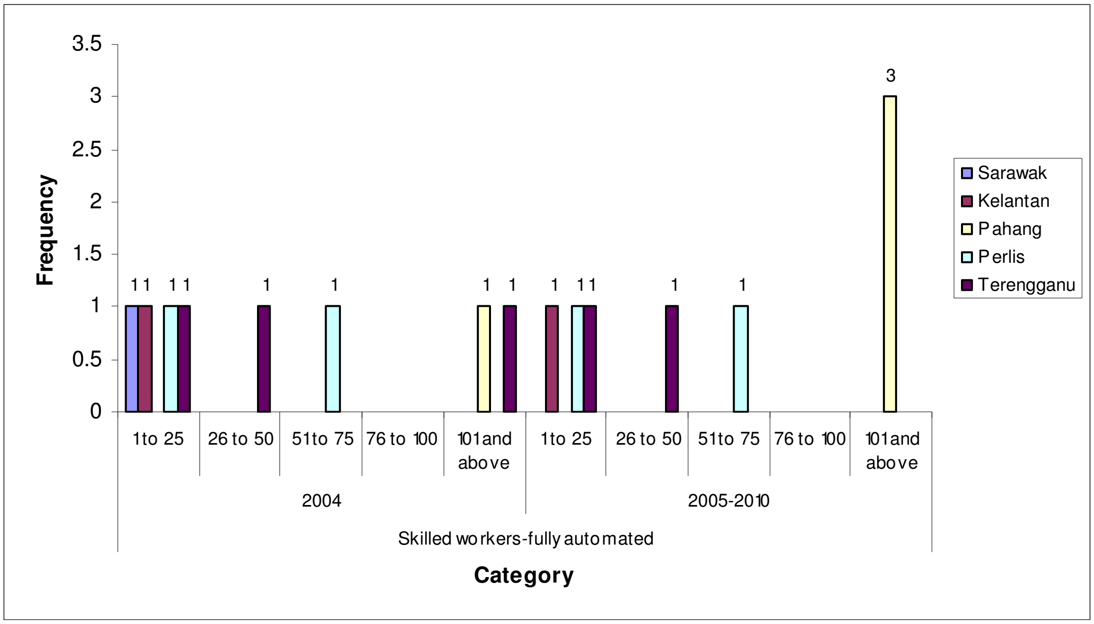

Figure 5.90: Skilled workers-fully automated in east coast

When asked to determine the projected workforce size required for skilled workers in fully automated technology, Fig. 5.90 indicates that as of 2004, more than 100 workers were needed by companies in Pahang and Terengganu, and other States requiring between 1 and 75 employees. A highly similar trend is expected in 2005-2010, with Pahang-located companies requiring over 100 skills workers in fully automated technology.

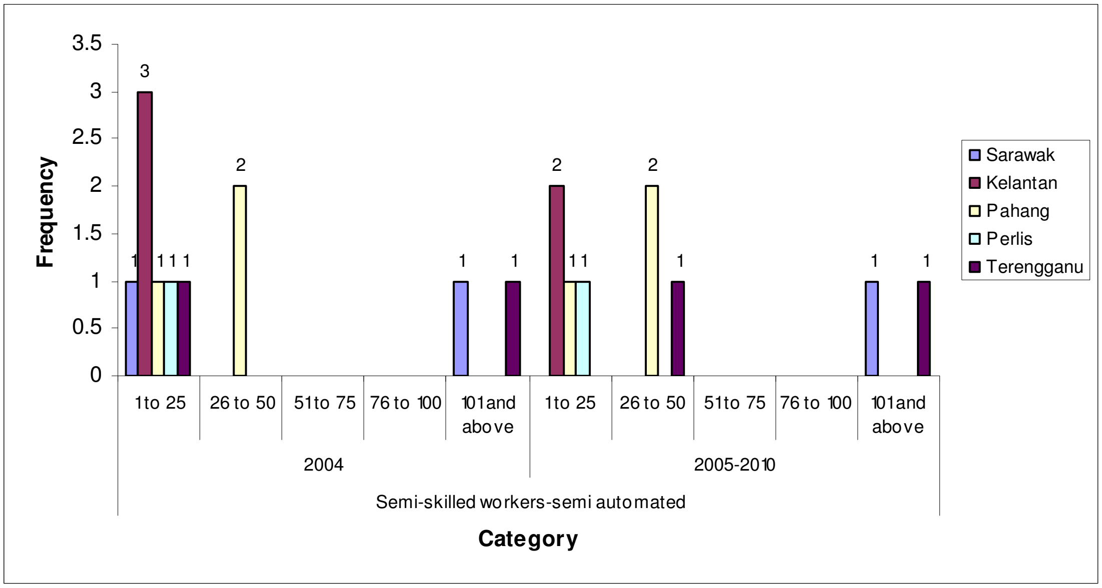

Figure 5.91: Semi-skilled workers-semi automated in east coast

Semi-skilled workers in semi-automated technology were also needed by the companies covered in the research. As shown in Fig. 5.91, two companies in Sarawak and Terengganu required more than 100 semi-skilled workers, while the need for such workers by other companies in other States ranged between 1 and 50 for 2004. The projected size for 2005-2010 is relatively similar with that in 2004.

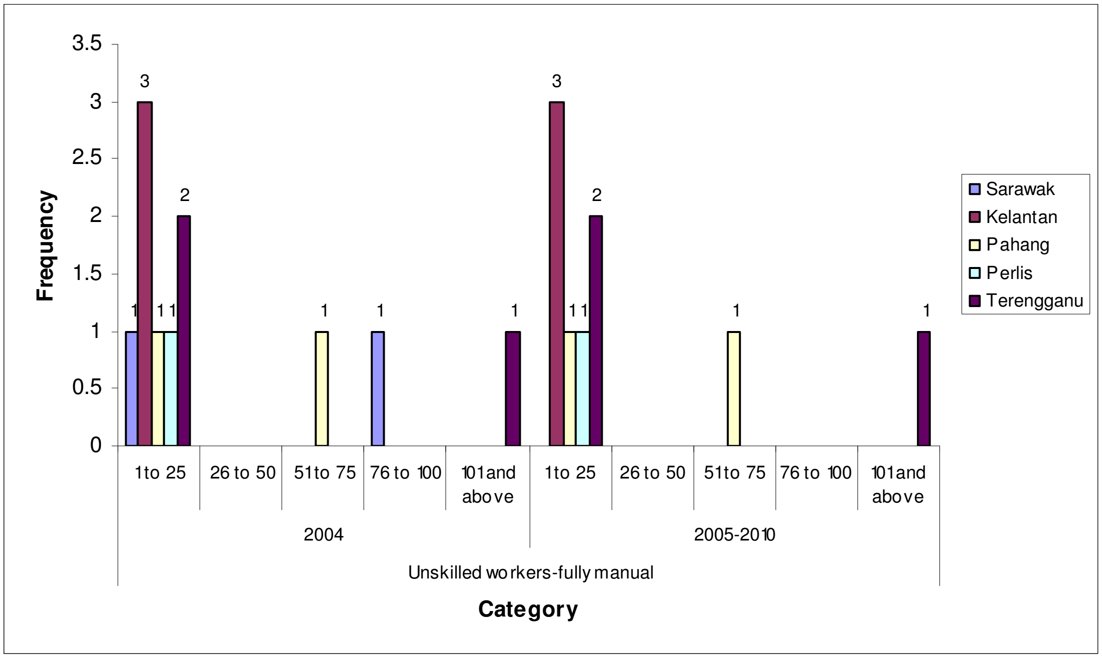

Figure 5.92: Unskilled workers-fully manual in east coast

The companies in this study also indicated the need for unskilled workers in fully manual technology. As of 2004, the data in Fig. 5.92 suggest that more than 100 such workers were needed in Terengganu, 76 to 100 were required in Sarawak, 51 to 75 in Pahang, and between 1 and 25 in other companies in all other States covered. A slight decline in demand for unskilled workers in fully manual technology for 2005-2010 could be observed, with two companies Terengganu and Pahang requiring more than 50 workers.

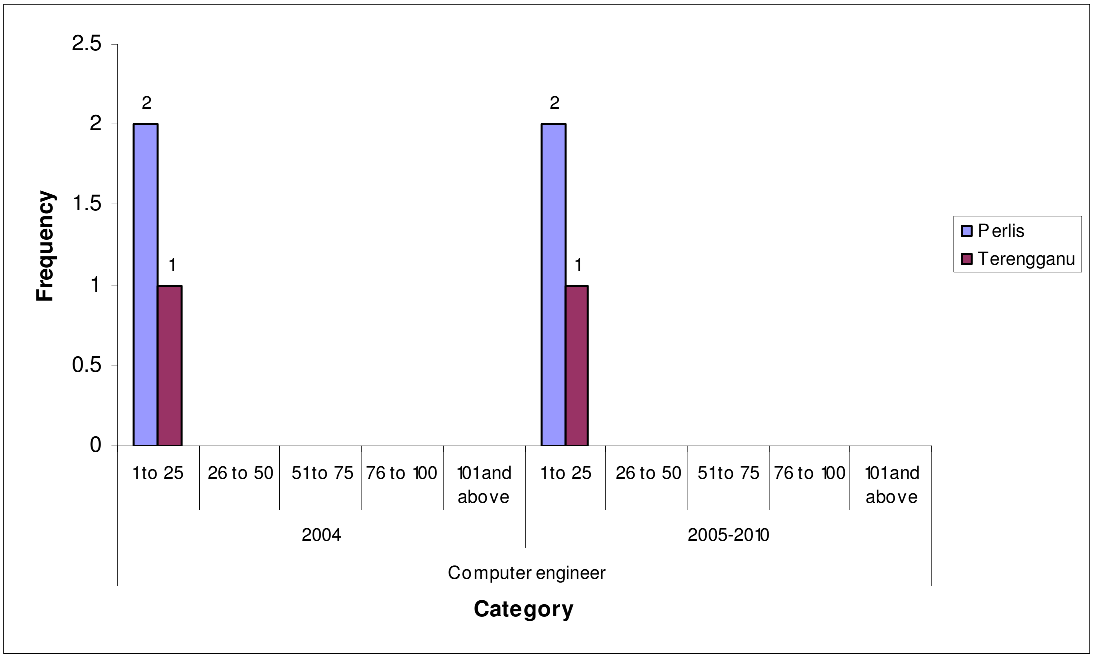

Figure 5.93: Computer engineer in east coast

In terms of ICT manpower, Fig. 5.93 shows that not more than 25 computer engineers were required in three companies in Perlis (n = 2) and Terengganu (n = 1) between 2004 and 2010.

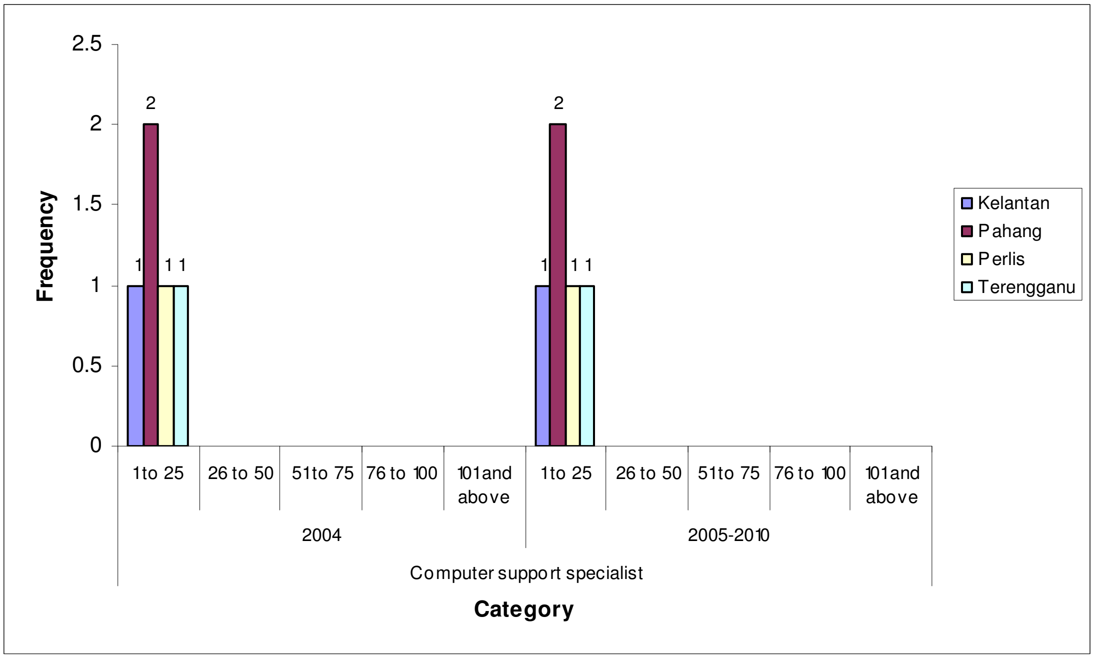

Figure 5.94: Computer support specialist in east coast

Computer support specialists were also required by the companies covered in the study. As shown in Fig. 5.94, between 1 and 25 specialists were required between 2004 and 2010, more specifically in Pahang, Kelantan, Perlis, and Terengganu.

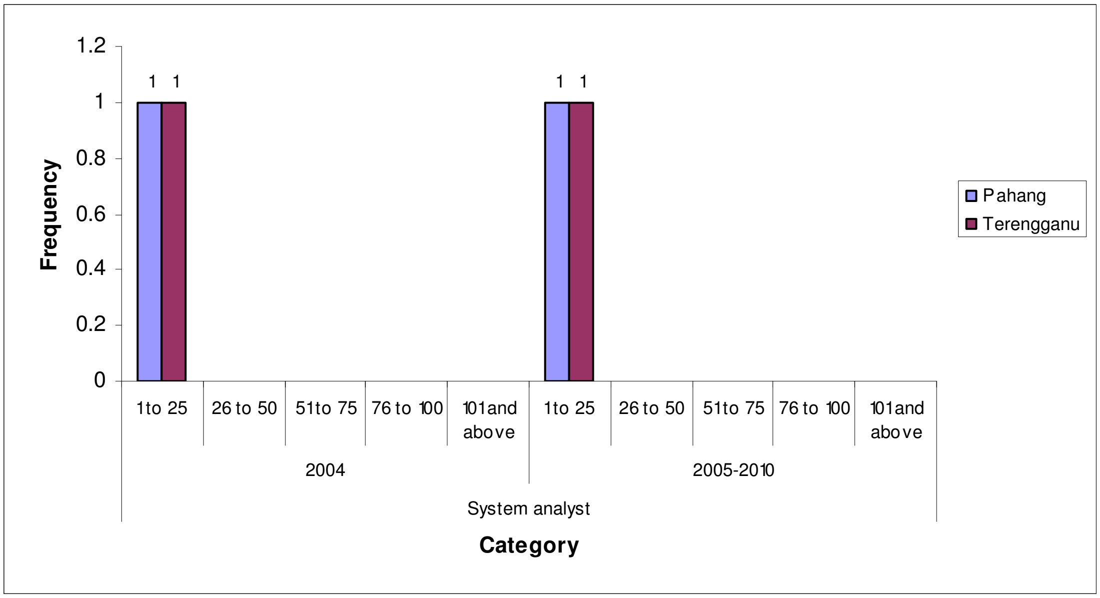

Figure 5.95: System analyst in east coast

The companies involved in the study also cited the need for system analysts. Specifically, this need is indicated by those in Pahang and Terengganu, with 1 to 5 manpower required between 2004 and 2010. Fig. 5.95 reflects the data.

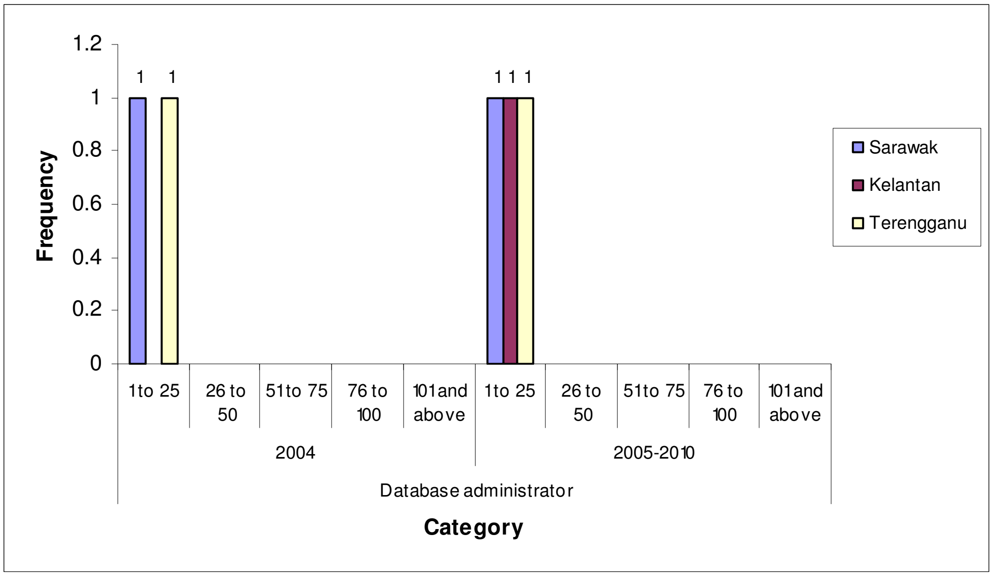

Figure 5.96: Database administrator in east coast

Data administrators were also mentioned by companies in Sarawak and Terengganu. Fig. 5.96 shows that between 1 and 25 data administrators were needed in 2004 in Sarawak and also in Terengganu. The same estimate could also be noted between 2005 and 2010 in Sarawak, Terengganu, and Kelantan.

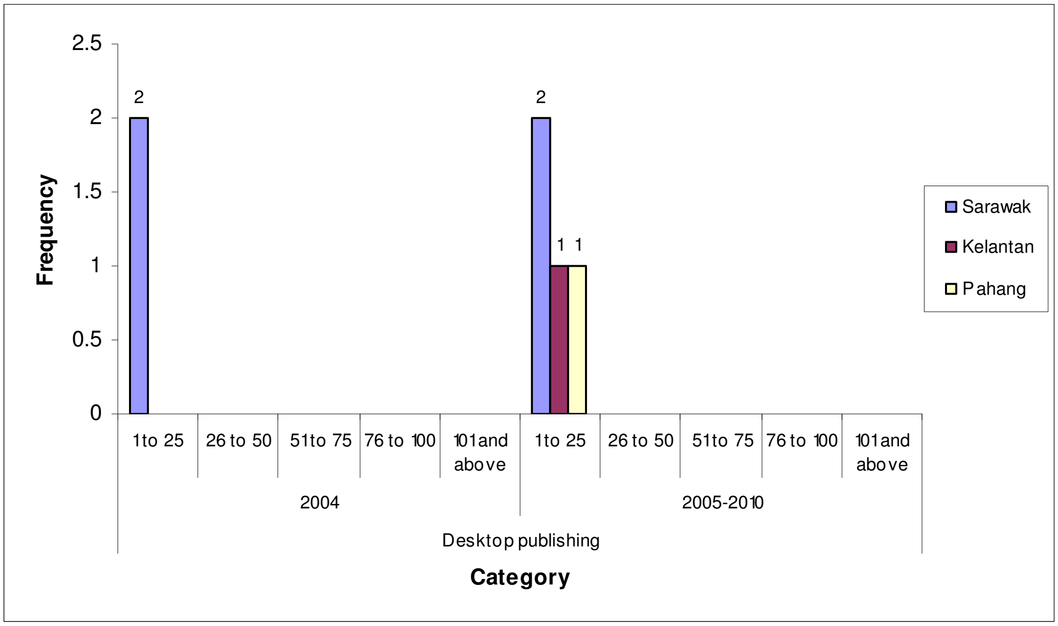

Figure 5.97: Desktop publishing in east coast

Manpower requirement for desktop publishing specialists was also cited, but it was only in Sarawak where between 1 and 25 specialists were needed in 2004. Between 2005 and 2010, Sarawak projected the same figures, and so with Kelantan and Pahang. Fig. 5.97 reflects the data.

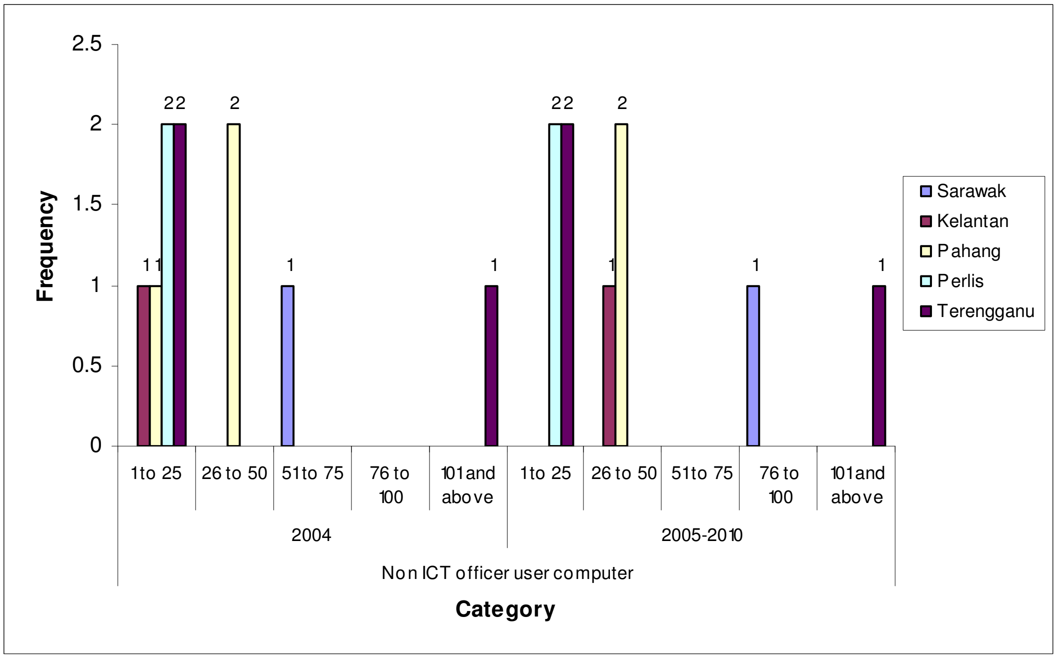

Figure 5.98: Workforces non ICT users in east coast

The findings of the study also found that a number of non-ICT officers used computers in daily operations. As of 2004, Fig. 5.98 shows that a company in Terengganu had more than 100 non-ICT officers utilizing computers in their work; Sarawak had 51 to 75; Pahang had 26 to 50; and a few others had 1 to 25. Between 2005 and 2010, the projection was the same for Terengganu, while Sarawak increased its requirements (51 to 75 manpower) up to 100 non-ICT officers using computers in daily operations. Others had estimates of between 1 and 50 for the said period.

5.9 The East Coast with the Information and Communication Technology (ICT) Adoption

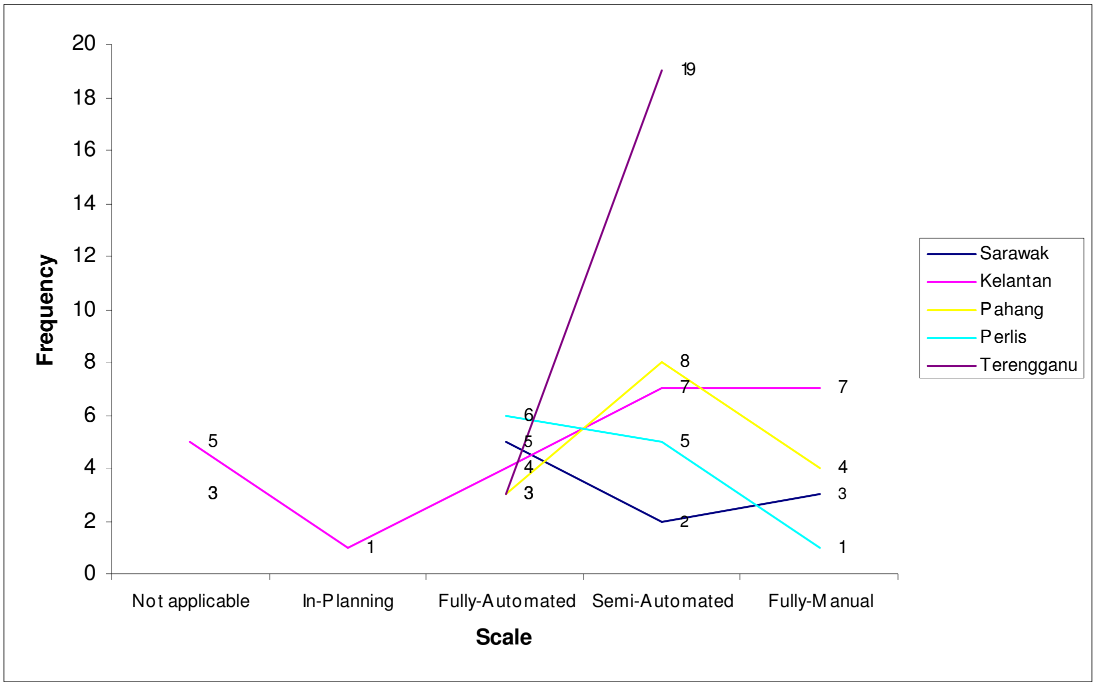

Figure 5.99: ICT adoption in administration in east coast

Adoption of ICT in terms of administration and operations in the states of Sarawak, Kelantan, Pahang, Perlis, and Terengganu was also examined in the study. In terms of administration, the data in Fig. 5.99 show that majority (n = 41) of the companies involved in the study were semi-automated, with a number of them in Terengganu (n = 19). Many were also fully automated (n = 18), with Perlis (n = 6) posting the highest in number. Other companies covered in the study were fully manual (n = 15), with companies in Kelantan (n = 7) taking the lead for such a practice. Some (n = 8) companies did not find the need for ICT adoption necessary, while the remainder was still planning for it.

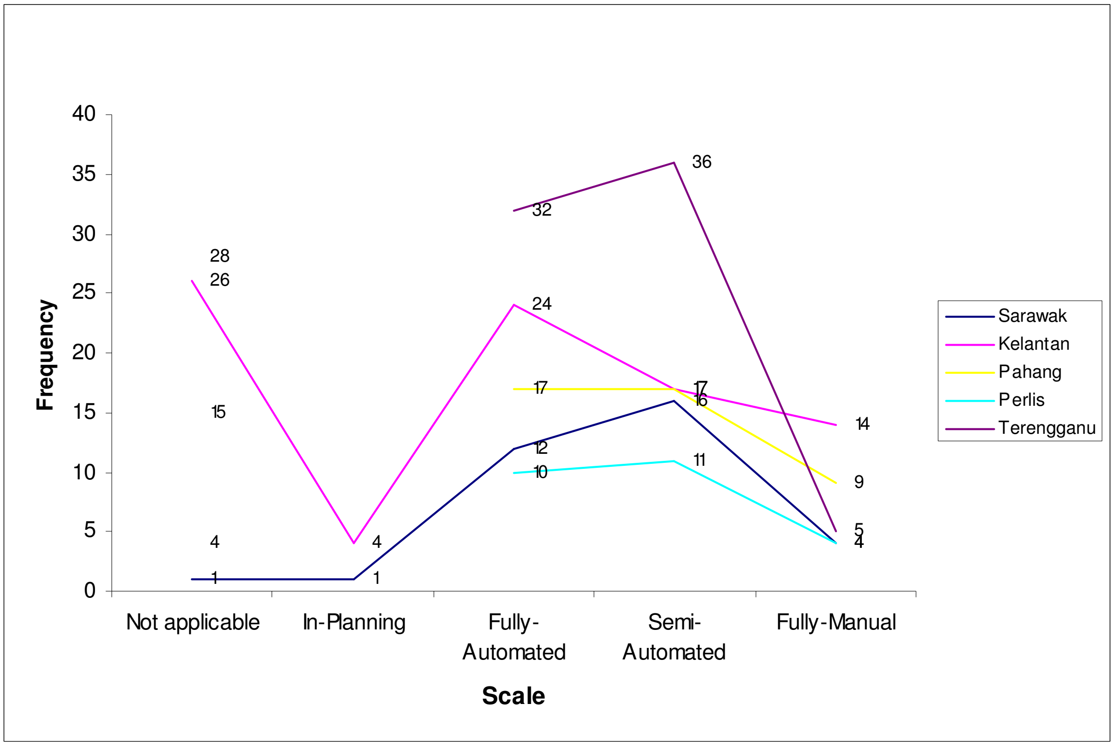

Figure 5.100: ICT adoption operations in east coast

ICT adoption in operations was relatively substantial and extensive yet not applicable to several companies. As shown in Fig. 5.100, the companies studied were mostly fully automated (n = 95) and semi-automated (n = 80) in their operations. The bulk of fully automated (n = 32) as well as semi-automated (n = 36) companies in terms of operations was found to be in Terengganu. The findings also showed that a number of fully manual-based operations were in Kelantan (n = 14). Seventy-four companies found ICT adoption in operations 'not applicable', while a small number (n = 5) was in its planning stage.

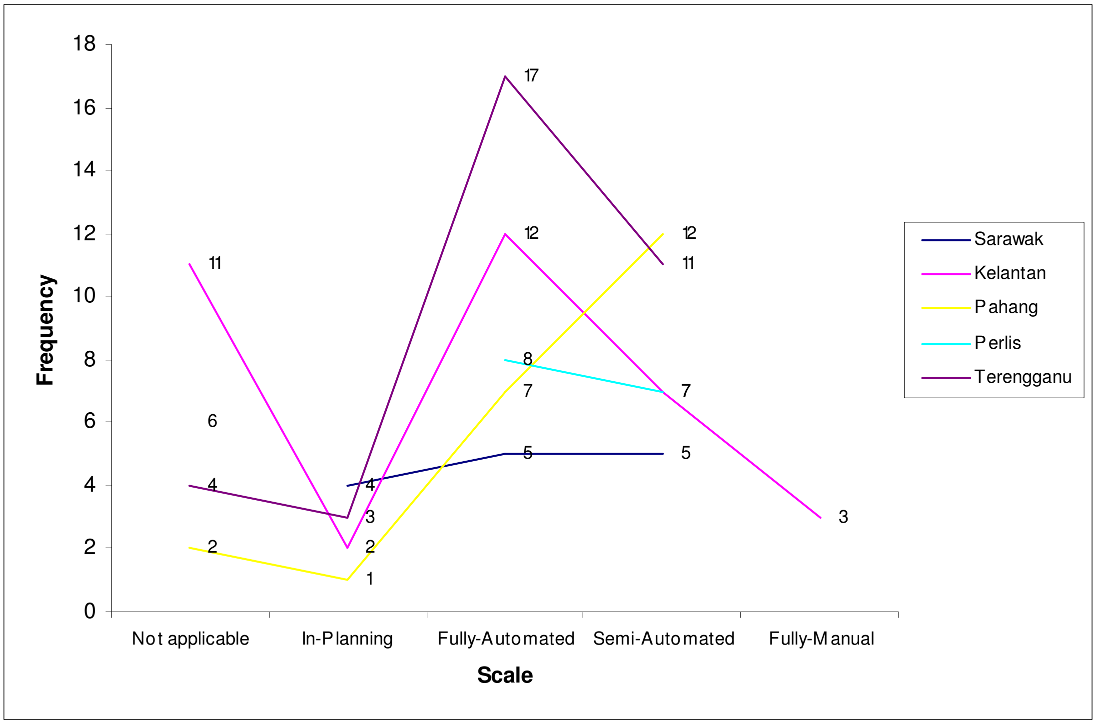

Figure 5.101: Usage of software in east coast

Software usage was also evident among the companies covered in this study, such as word processing, spreadsheet, and database, to name a few. Of the companies studied, 49 were fully automated, with 17 of them based in Terengganu. Thirty-five were semi-automated, with 12 of them located in Pahang. Three companies were fully manual, which are all based in Kelantan. Ten were in the planning stage, while 23 of them responded 'not applicable'. Fig. 5.101 presents the data.

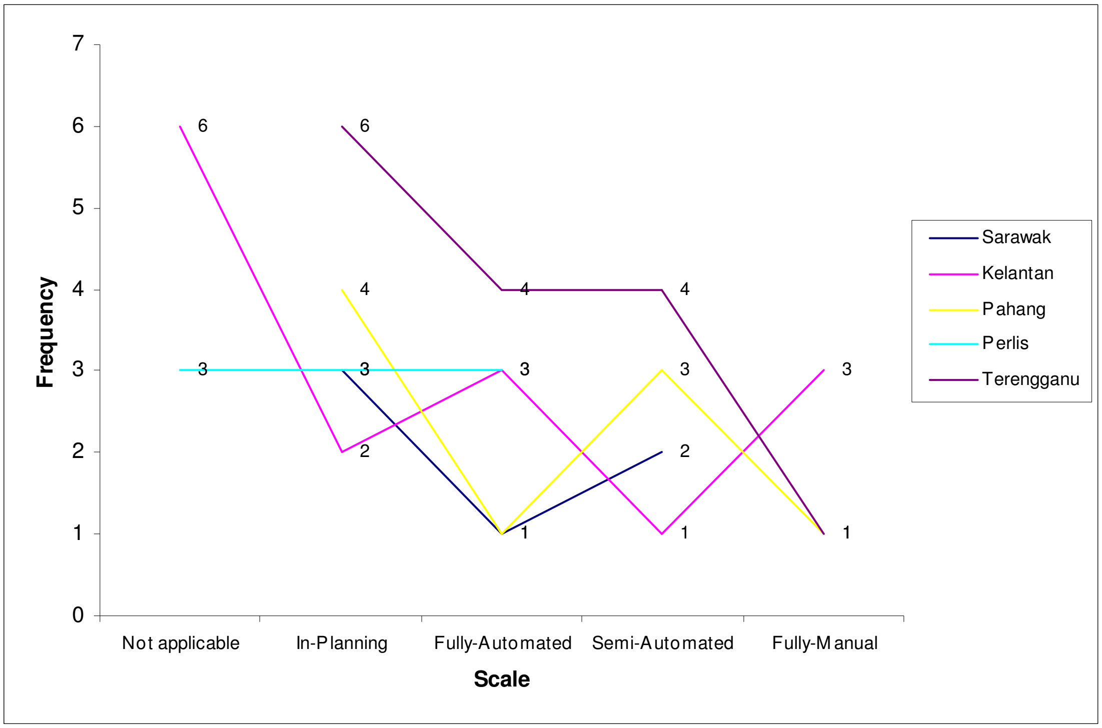

Figure 5.102: Types of business in company's in east coast

The companies involved in this research were operating on business to business, business to customers, and business to government transactions. Only eight of these companies were fully automated, half of which were located in Terengganu. Ten were semi-automated, with about half also based in Terengganu (n = 4). Fifteen of them were in the planning phase, while nine responded 'not applicable'. Fig. 5.102 reflects the data.

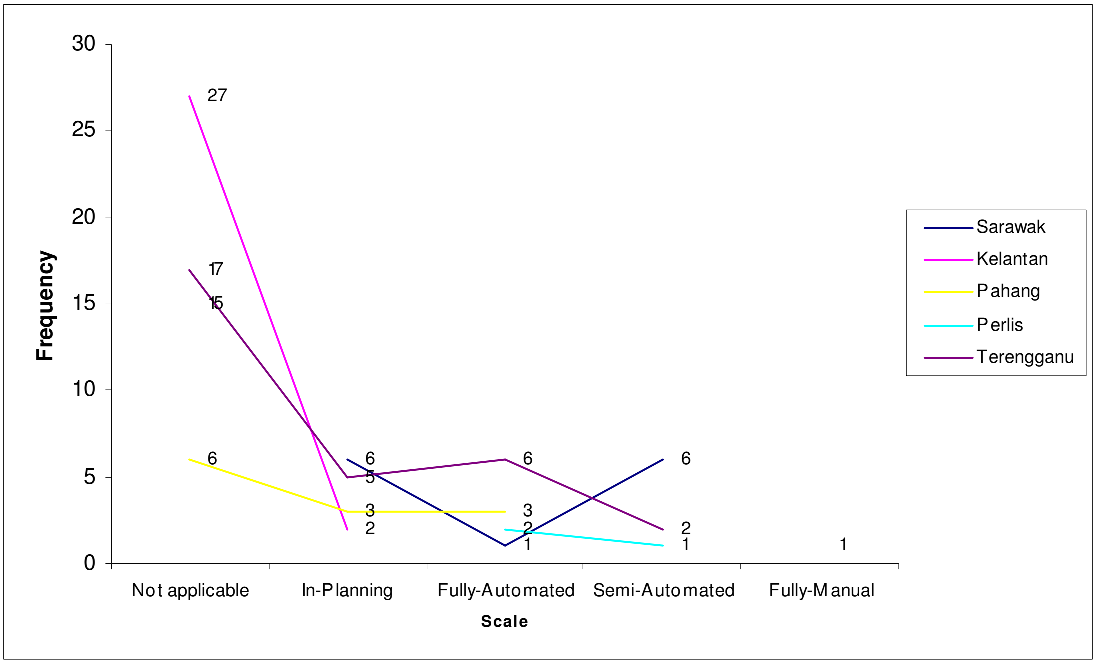

Figure 5.103 Stand-alone technology adoption in east coast

In terms of technology adoption, the companies that responded to this study adopted stand-alone (e.g., engineering technology and design), intermediate (e.g., material control technology), and integrated (e.g., just-in-time) forms of technology. For those that adopted stand-alone technology, Figure 6.103 shows that only a few were fully automated (n = 12), half of which were based in Terengganu. Nine of the companies were semi-automated, with two-thirds (n = 6) of them in Sarawak. A number of them were still in the planning stage (n = 16), and a great majority (n = 65) said this was not applicable yet.

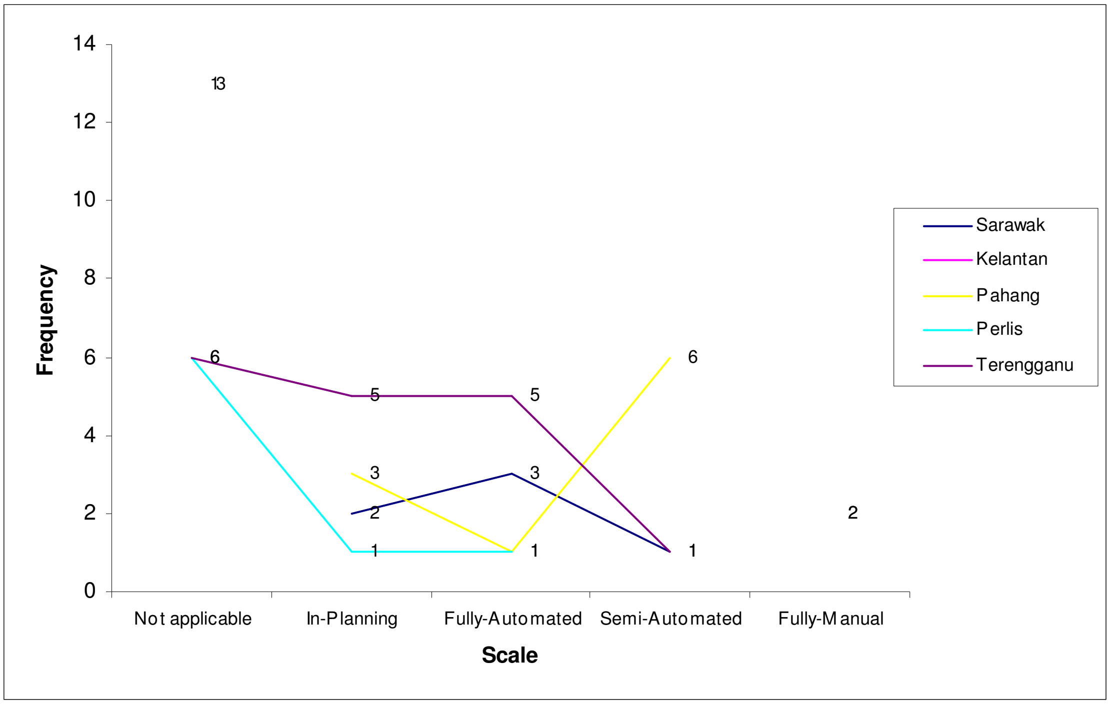

Figure 5.104: Intermediate technology adoption in east coast

Of the companies that adopted intermediate technology, nine were fully automated, five of which were located in Terengganu. Seven were semi-automated, six of which were based in Pahang. Eleven were in the planning phase, while 19 said 'not applicable'. Fig. 5.104 presents the data.

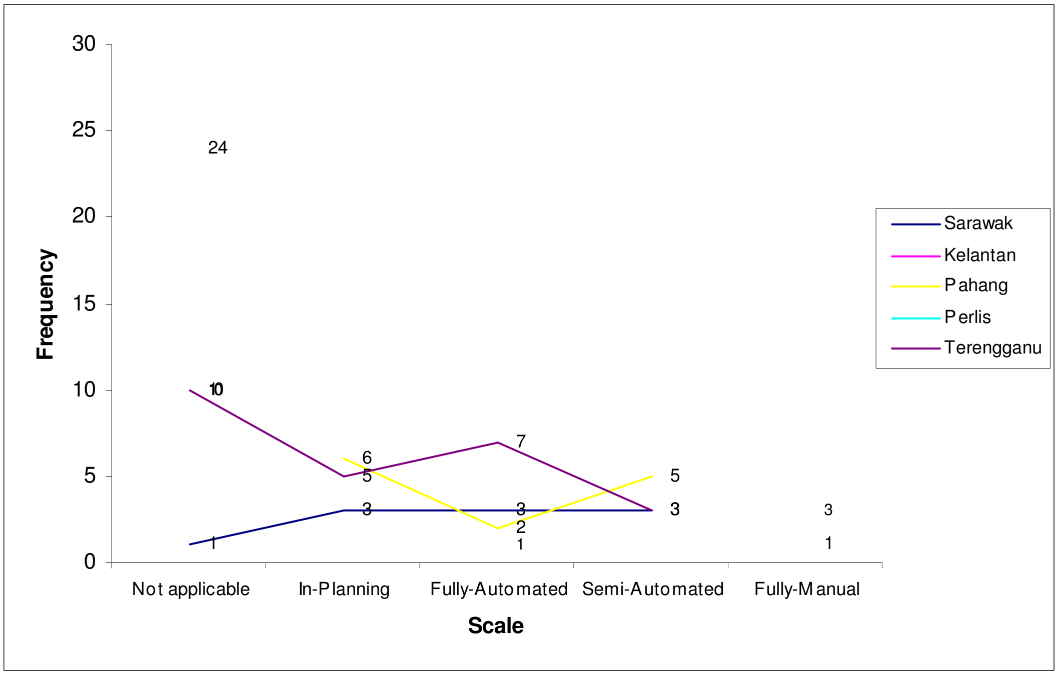

Figure 5.105: Integrated technology adoption in east coast

Many of the companies said that integrated technology was not applicable (n = 35) in their companies, 24 of which were based in Pahang. Thirteen companies were fully automated, while eight were semi-automated. Four were fully manual, while others (n = 14) were in the planning stage. Fig. 5.105 presents the data.

5.10 Training Programs

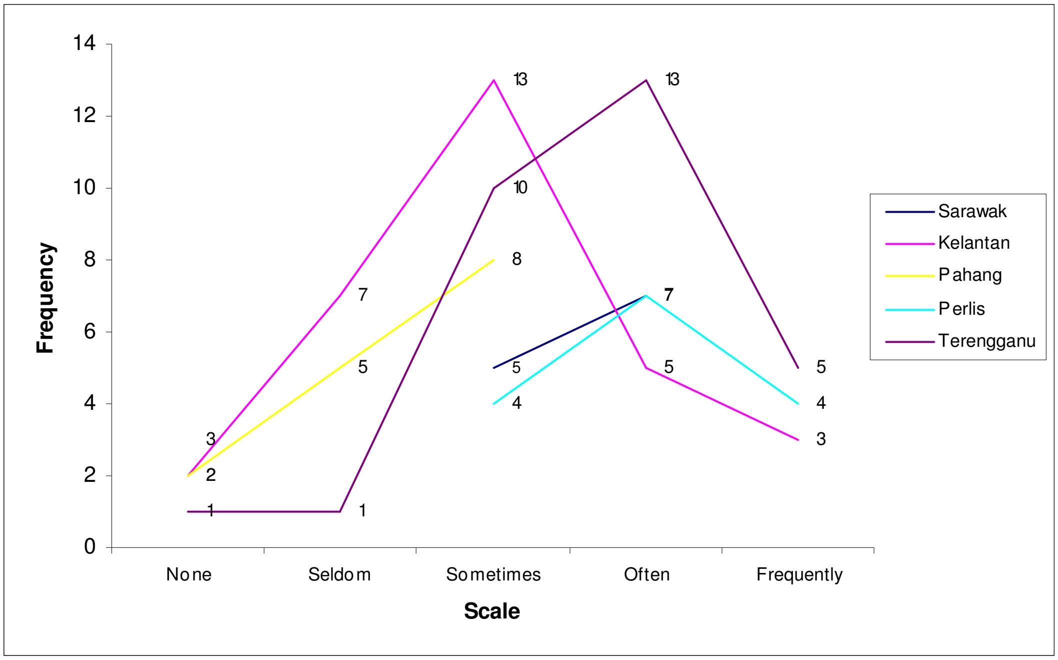

Figure 5.106: Administration training ICT in east coast

The frequency of training programs provided to the workers was also explored. These programs included those on information technology, customer service and public relations, marketing, management skills, among others. The findings of the study in terms of administrative training on ICT are reflected in Fig. 5.106. As shown, many of the companies involved in the study provided ICT training, the occurrence of which ranged from 'frequently' to 'seldom'. Specifically, those in Terengganu had the most 'often' (n = 13) and 'frequently' (n = 5) conducted training. Several companies (n = 40) also said 'sometimes', in particular those in Kelantan (n = 13). Six companies did provide such training.

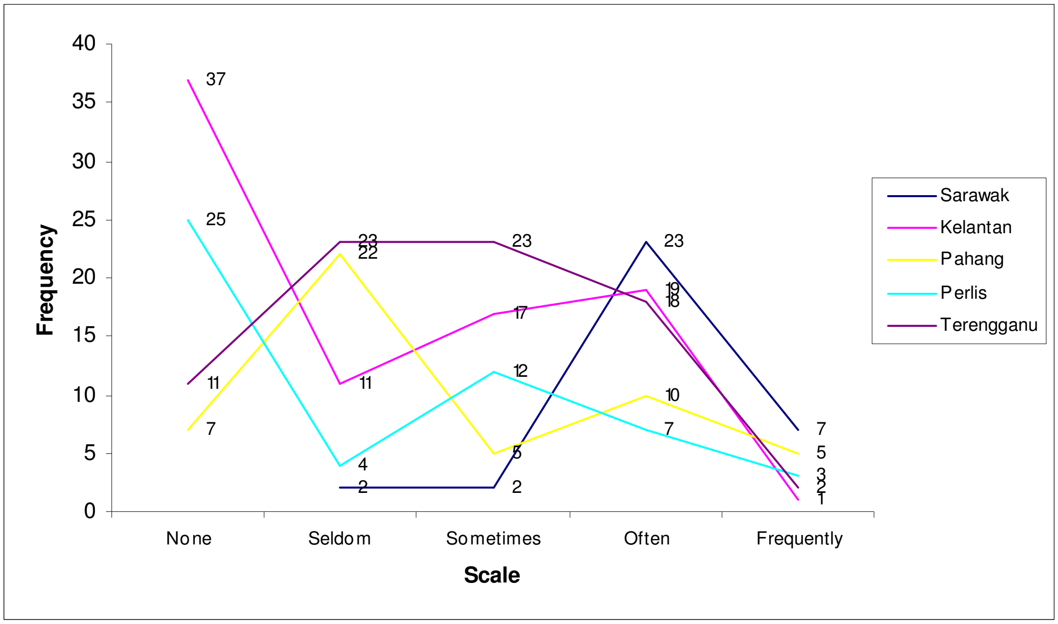

Figure 5.107: Operations training ICT in east coast

Training on operations was also afforded to the employees of companies involved, such as those that relate to scheduling, product development, credit control, and forecasting, to name a few. As reflected in Fig. 5.107, those in Sarawak (n = 7) had the most 'often' (n = 23) and 'frequent' (n = 7) training. As a whole, 77 companies responded 'often', while 59 companies said they provided such training 'sometimes'. A sizeable number (n = 62) 'seldom' conducted ICT training for operations, while 80 companies had no such training at all, most notably in Kelantan (n = 37).

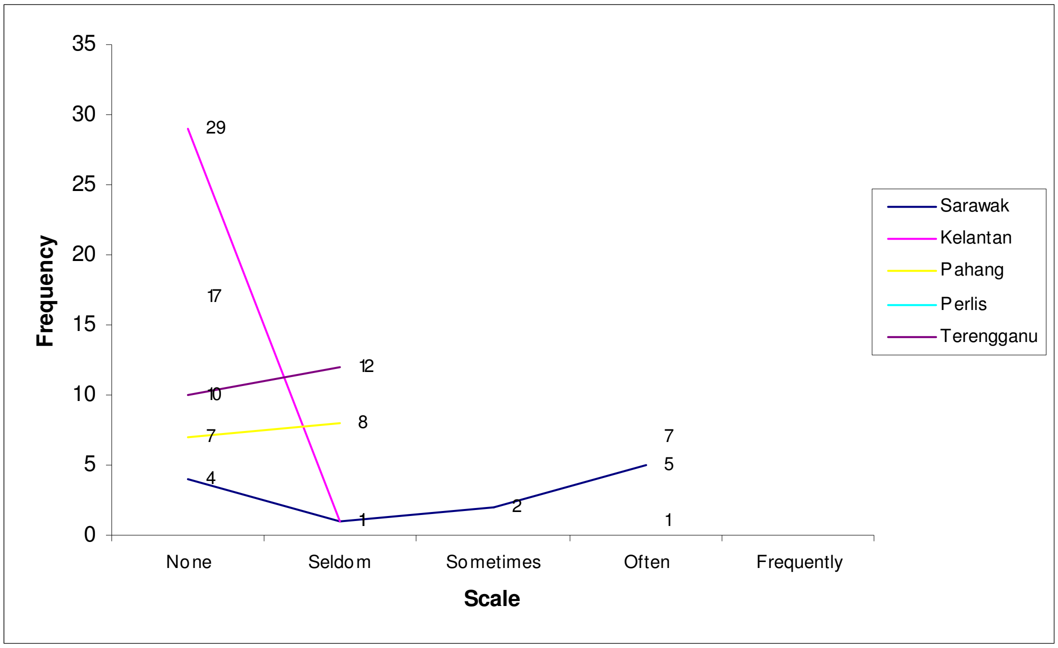

Figure 5.108: Stand-alone technology training in east coast

Operations technology training was also investigated, with the aim of determining frequency of training opportunities for stand-alone (e.g., computer-aided design), intermediate (e.g., automated material handling system), and integrated (e.g., flexible manufacturing cell systems) technologies. Fig. 5.108 shows that only a few (n = 36) had stand-alone technology training, with Pahang (n = 7) and Sarawak (n = 5) having the most 'often' programs. A large number (n = 67) of the companies involved had no such training for stand-alone technology.

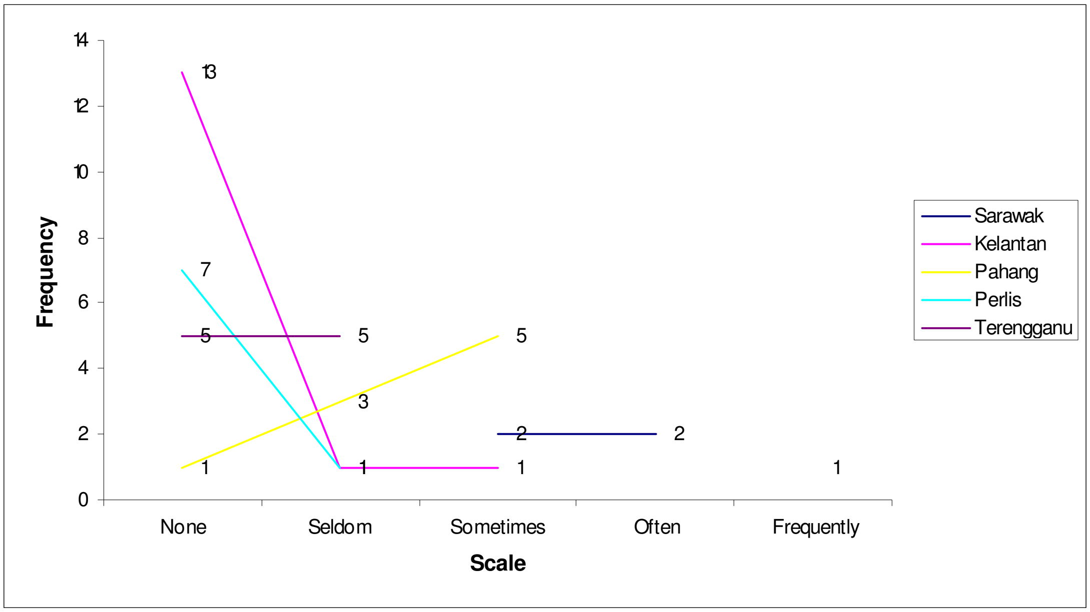

Figure 5.109: Intermediate technology training in east coast

A similar trend was observed in intermediate technology, with a slight increase in the number of companies engaged in intermediate technology-related training. As Fig. 5.109 presents, seven of these companies responded ‘often’, notably in Pahang (n = 5) and in Sarawak (n = 2). The bulk of those which responded ‘sometimes’ were in Perlis (n = 5), while 28 of them had no intermediate technology training in place.

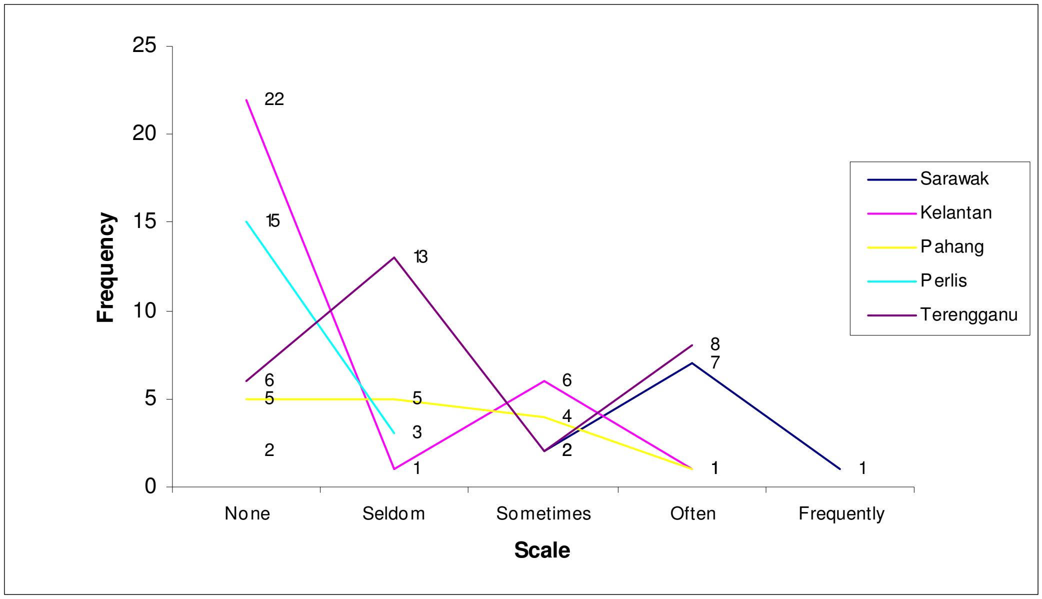

Figure 5.110: Integrated technology training in east coast

In terms of integrated technology training, a company in Sarawak ‘frequently’ conducted training on such form of technology, while 16 others had it ‘often’, more specifically in Terengganu (n = 8), Sarawak (n = 7), and Kelantan (n = 1). Others responded ‘sometimes’, notably in Kelantan (n = 6), Perlis (n = 4), and Sarawak (n = 2). A sizeable number (n = 22) ‘seldom’ implemented training on integrated technology, while a considerable number (n = 50) had ‘none’ at all. Fig. 5.110 presents the data.

5.11 Measurement of Company's Productivity

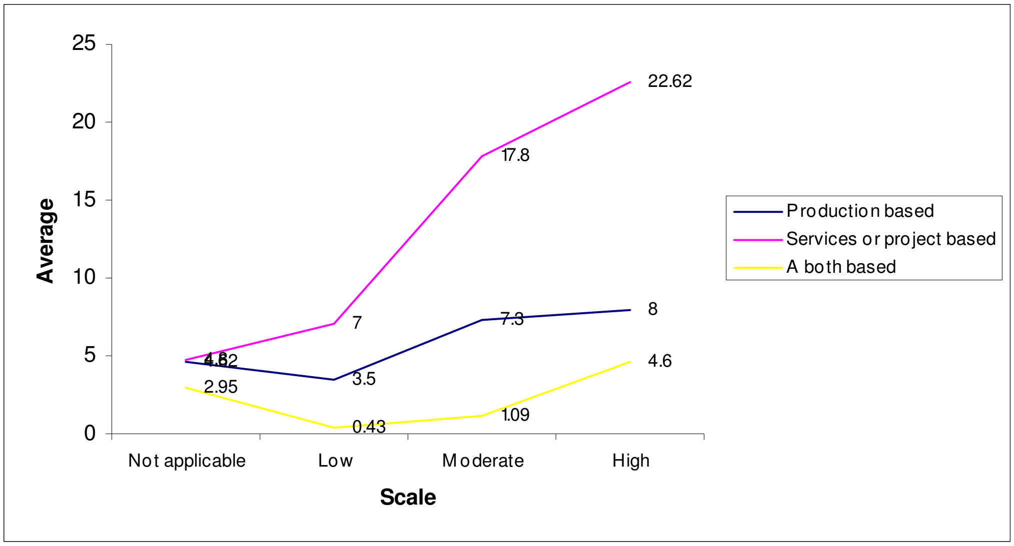

Figure 5.111: Productivity of company activity by the production, services or project and a both based in company's

This section shows the findings on the effects of technology and ICT adoption on the company's productivity, more specifically on those that focused on 'production' and on 'services', or on either of these types only. Overall, both types of companies seemed to have a highly favorable view on the impact of technology and ICT adoption on their productivity, as evidenced by the mean score of 4.6 (max. = 5.0). Seemingly, more services or project-based companies (mean = 7.0 - 22.62) found technology and ICT adoption more beneficial than production-based companies (mean = 3.50 - 8.0). Fig. 5.111 shows the data.

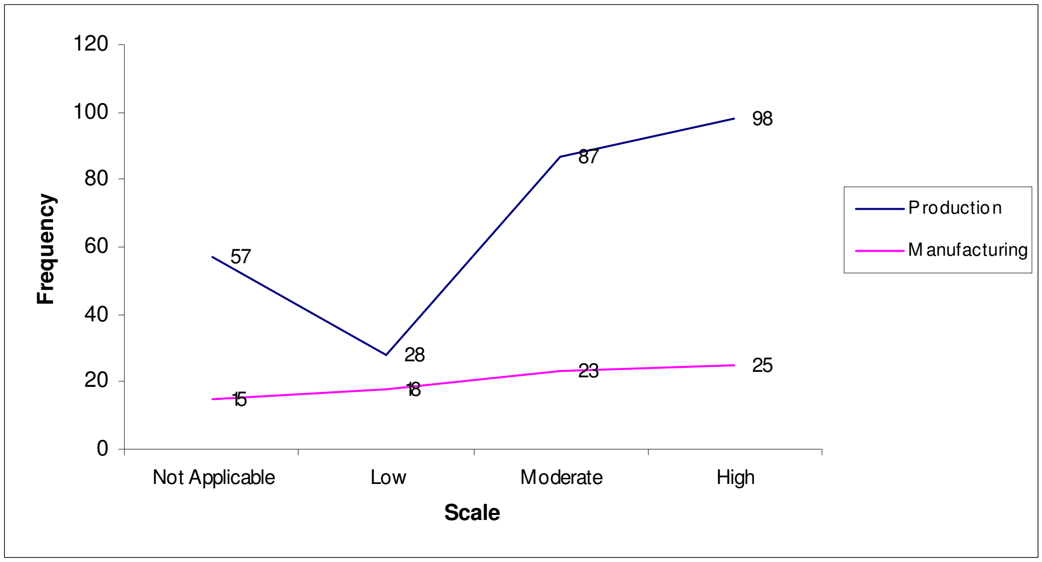

Figure 5.112: Productivity of company activity based on production in company's

For production-based companies involved in this research, 270 of them were production-oriented, while 81 were into manufacturing businesses. Of the former, 98 of them responded a 'high' impact of technology and ICT adoption on productivity, while the of the latter, 25 companies said so. Fig. 5.112 presents the data.

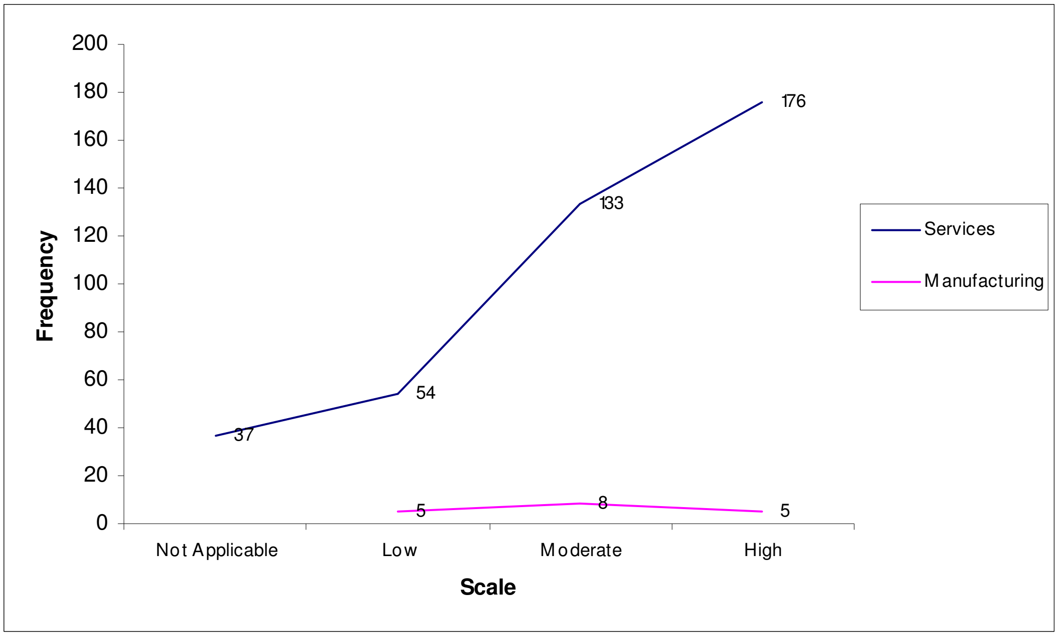

Figure 5.113: Productivity of company activity based on services or project in company's

Four hundred eighteen services or project-based companies took part in this study, where 400 were doing 'services' activities, and the remainder, 'manufacturing' work. Of those involved in the services, 176 companies believed that their productivity was influenced by technology and ICT adoption, while 133 said the influence was 'moderate'. Of those in the manufacturing business, between 5 and 8 said the influence of technology and ICT adoption ranged between 'low' (n = 5) to 'high' (n = 5). The data are presented in Fig. 5.113.

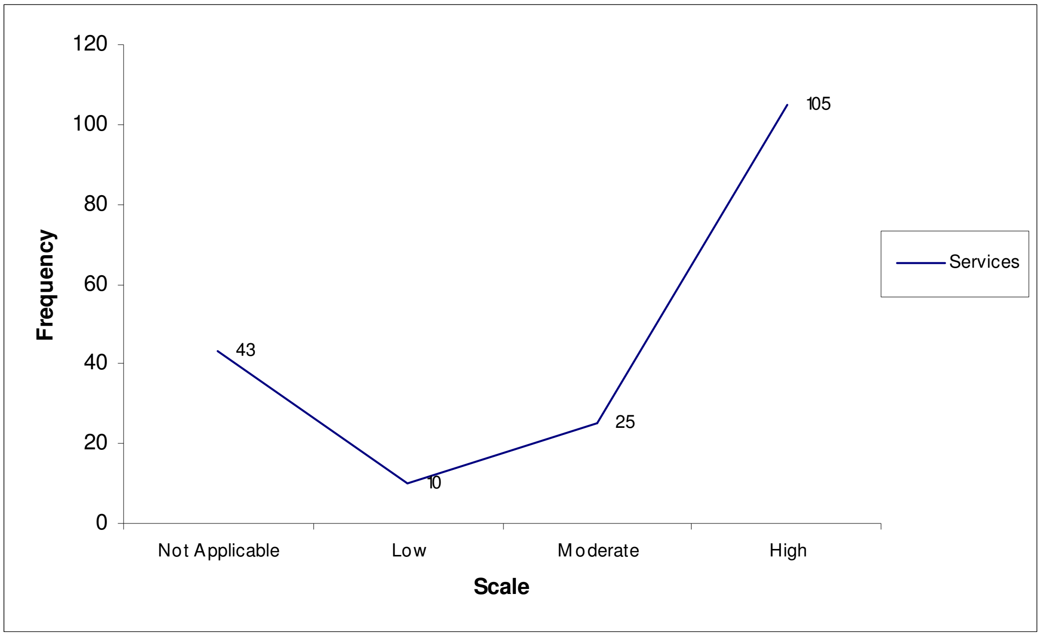

Figure 5.114: Productivity of company activity based on both in company's

The company based on a both that find about one hundred zero five the measurement of productivity is higher. But for the not applicable was shown fourteen three the productivity of the company based on manufacturing. Of those involved in the services, 105 companies believed that their productivity in manufacturing and services was influenced by technology and ICT adoption, while 25 said the influence was 'moderate'. Of those in the a both, between 10 and 43 said the influence of technology and ICT adoption ranged between 'low' and not applicable.

CHAPTER SIX
INFERENTIAL ANALYSIS

6.1 Introduction

This chapter presents the findings on inferential analyses of the data. Specifically, this chapter highlights the results on correlation analyses of certain variables. Findings are organized according to this sequence: Administration, Operation, Usage of Software, Technology Adoption, Training Programs, Types of Business, and Measurement of Company's Productivity. Lastly, the impact of training programmes to the company's productivity is also described.

6.2 Administration

In administration, five items have been identified to be measured for its level of automation. The average scales for each level of automation are calculated and the results are displayed in Table 6.1.

Table 6.1:
The average scales for each automation level of administration section

	Purchasing	Tender	Cost and expenses	Bookkeeping	Human resource management
Not Applicable	9.16	28.33	4.16	3.33	2.5
In-Planning	4.16	1.66	0.83	0.83	1.66
Fully-Automated	23.33	14.16	25	**45.83**	20.83
Semi-Automated	**43.33**	36.66	**55.83**	40	**55.83**
Fully-Manual	20	19.16	14.16	10	19.16

Based on the results shown in Table 6.1, the adoption of communication and ICT for most SMIs is at semi-automated level. At this level, the cost and expenses, and human resource management obtain the highest average (both at 55.83%). Among the five administration items, bookkeeping activity scores the highest average scales for the fully automated adoption level (45.83%). Nevertheless, the average scales for other items that are fully automated within the range of 14 to 25 percent. The average scales for the administration activities are presented in Fig. 6.1.

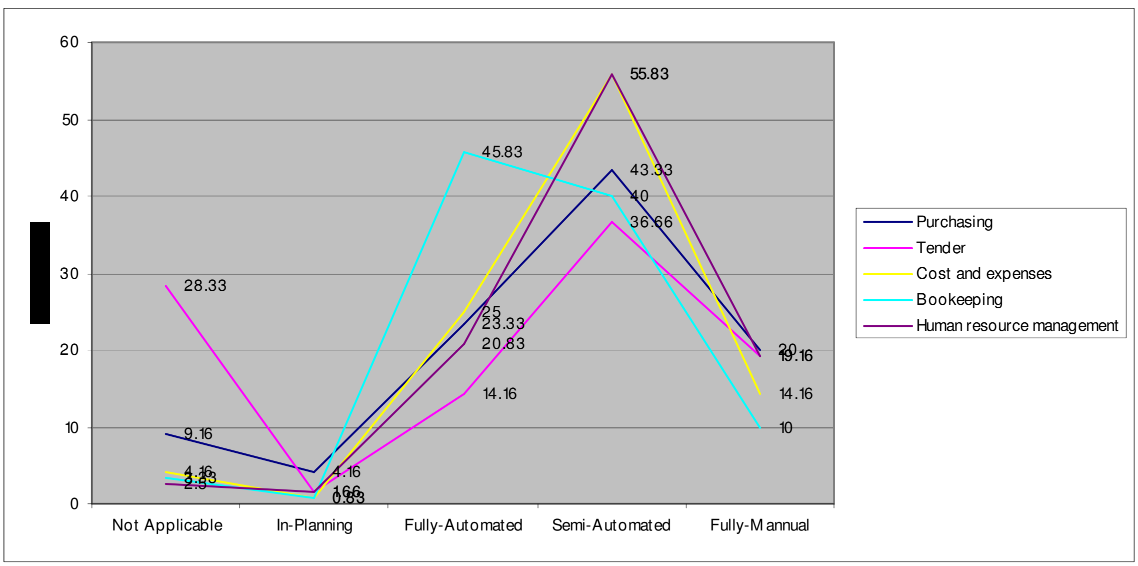

Figure 6.1: The average scales of administration activities in ICT adoption

Clearly the peak lies on semi-automated and fully automated level. The lowest average scales lie in in-planning activity. This indicates that most SMIs have not planned to increase the adoption of ICT.

To investigate the correlation between the sizes of employees with the administration activities for the ICT adoption, the results are illustrated in Table 6.2.

Table 6.2:The correlation between the size of employees and the administration activities

Administration Activities		**(r)**
Purchasing	Correlation Coefficient	-.029
	Sig. (1-tailed)	.378
Tender	Correlation Coefficient	-.020
	Sig. (1-tailed)	.413
Cost and expenses	Correlation Coefficient	-.207*
	Sig. (1-tailed)	.012
Bookeping	Correlation Coefficient	-.242**
	Sig. (1-tailed)	.004
Human resource management	Correlation Coefficient	-.257**
	Sig. (1-tailed)	.002

* Correlation is significant at the 0.05 level (1-tailed)
** Correlation is significant at the 0.05 level (1-tailed)

The correlation results indicate that the most significant of administration-related activities is human resource management (p = 0.002), followed by bookkeeping (p = 0.004) and cost and expenses (p = 0.012). All the three significant activities are in agreement with the average scales obtained in the earlier analysis.

6.3 Operation

A total of 15 items were tested for the impact of ICT adoption at the operational level. The average scales for each item of operational activities are calculated and the results are displayed in Table 6.3.

Table 6.3:
The average scales for each automation level of administration activities

	Material control	Scheduling	Selling	Product development	**Production operation**	Human resource recruitment	Project management	Distribution	Supplies
Not Applicable	12.5	8.33	24.16	25.83	27.5	6.66	16.66	22.5	20.83
In-Planning	2.5	2.5	1.66	2.5	1.66	0.83	1.66	2.5	2.5
Fully-Automated	21.66	21.66	22.5	26.66	27.5	8.33	17.5	24.16	20
Semi-Automated	**41.66**	**47.5**	39.16	34.16	35	**50.83**	**48.33**	32.5	38.33
Fully-Manual	21.66	20	12.5	10.83	8.33	33.33	15.83	18.33	18.33

	Invoice/ billing	Marketing/ advertising	Credit control	Customer service	**Engineering**	**Fixed asset management**	**Inventory control**	Forecasting
Not Applicable	5	19.16	16.66	9.16	31.66	9.16	7.5	14.16
In-Planning	2.5	1.66	2.5	5.83	0.83	0.83	2.5	4.16
Fully-Automated	38.33	15	34.16	18.33	22.5	26.66	30	24.16
Semi-Automated	**40.83**	**47.5**	38.33	**46.66**	35	**43.33**	**40**	**40**
Fully-Manual	13.33	16.66	8.33	20	10	20	20	17.5

The results displayed in Table 6.3 indicate that the average scales for semi-automated for all operational activities score at least 32.5 percent and at most is 50.83 percent. Note also that other average scales did not reach 40 percent. This implies that currently the adoption of ICT for most SME is at semi automated level. The highest score is achieved by human resource recruitment (50.83 %), followed by project management (48.33%) and inventory (30.00%). For the fully automated level, the invoice/ billing and credit control scores 38.33 and 34.26 percent, respectively. The results exhibited in Table 6.3 also reveal that most activities at operational level are not much fully-manual, particularly for credit control activity.

For graphical illustration, the average scales for each operational activity is shown in Figure 6.2. Similar patterns of graphs are observed as in the administration activities. The peak is highest at semi-automated level and lowest at in-planning activities. This means that the SMEs have not planned to increase their ICT adoption. Note also that ICT adoption is not applicable in Engineering (31.66%).

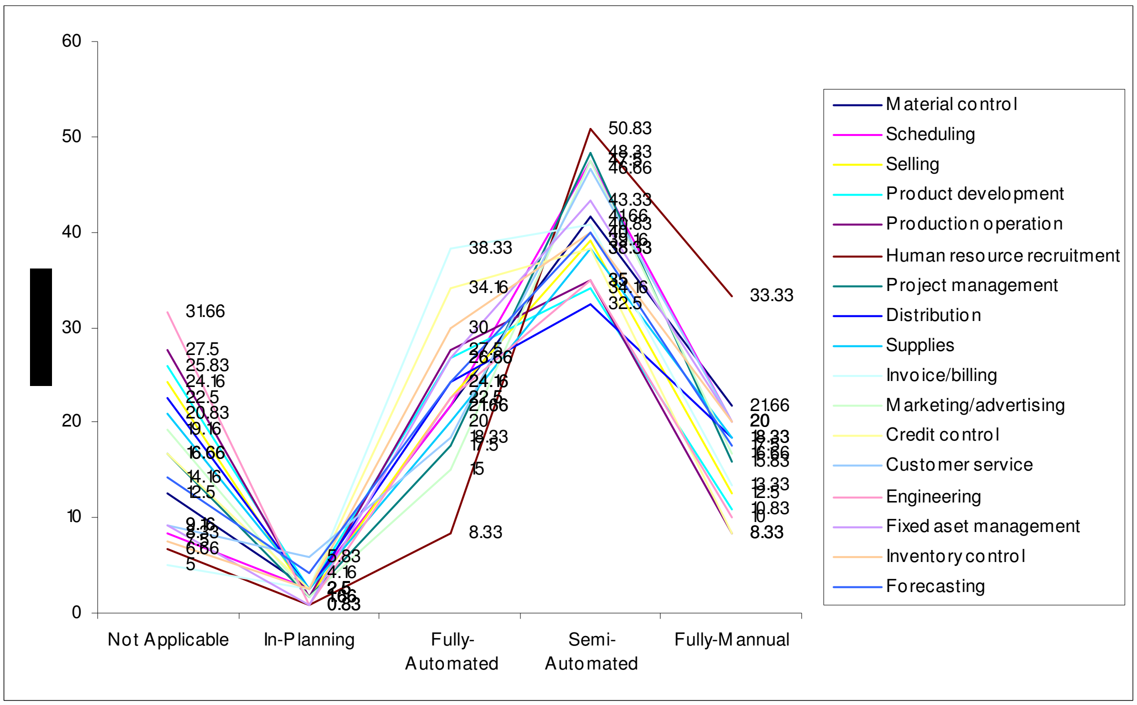

Figure 6.2: The average scales of operations activities in ICT adoption

To investigate further, the correlation analysis is carried out on the impact of size of employee with the ICT adoption for the operational activities. The results are displayed in Table 6.4. The operational items that are significantly correlated with the size of employee are presented in the order of smallest to bigger significant values. With reference to Table 6.4 and Fig. 6.3, it is surprising that engineering section scores the least significant value (p = 0.002) and yet its *not applicable average level* for ICT adoption is also high (mean = 31.66 percent). For inventory control, the correlation is significant at 5 percent level (p = 0.022), and the average scales for both semi-automated levels (30.00%) and fully (40.00%) reach more than 30 percent.

Table 6.4:
The correlation between the size of employees and the operational activities

Operational Activities		**(r)**
Engineering	Correlation Coefficient	.259**
	Sig. (1-tailed)	.002
Production operation	Correlation Coefficient	.233**
	Sig. (1-tailed)	.005
Invoice/billing	Correlation Coefficient	-.202*
	Sig. (1-tailed)	.013
Fixed asset management	Correlation Coefficient	-.189*
	Sig. (1-tailed)	.020
Inventory control	Correlation Coefficient	-.184*
	Sig. (1-tailed)	.022

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

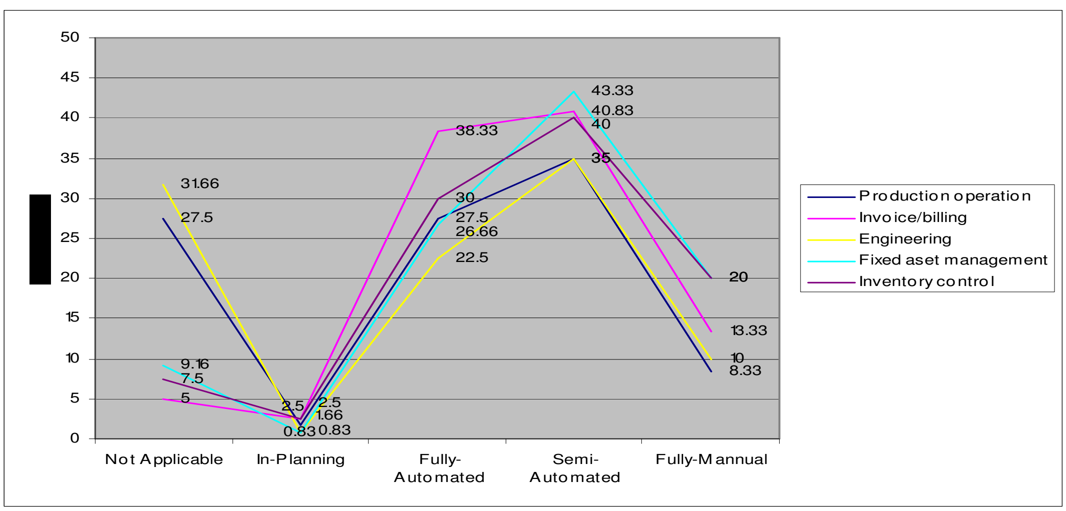

Figure 6.3: The average scales of selected operational activities in ICT adoption

6.4 Usage of Software

Apart from the impact of ICT on the administration and operational activities, the usage of software in the SME is also explored. First, the average scale for each software application used in the organization is calculated and the results are displayed in Table 6.5.

Table 6.5:
The average scales of the usage of software in SMEs

	Word processing	Spread sheet	Database	Project planning	Human resource planning	E-mail	Website
Not Applicable	9.16	9.16	10	17.5	10	5	7.5
In-Planning	1.66	1.66	3.33	5	2.5	5.83	8.33
Fully-Automated	**62.5**	**55.83**	**55**	25.83	21.66	**69.16**	**70.83**
Semi-Automated	20	27.5	26.66	**44.16**	**45.83**	18.33	10.83
Fully-Manual	6.66	5.83	5	7.5	20	1.66	2.5

Based on the average fully-automated scales, website and e-mail score the highest and second highest compared to the rest of software applications (70.83% and 69.16%). The third highest average scale is shown by word processing and spread sheet, respectively (62.5% and 55.83%). This is expected since most SMEs have utilized word processing, email and also website for competitive advantages. Human resource planning and project planning are still at semi-automated level (44.15% and 45.83%), although there is some indication that some SMEs have made these activities fully automated (25.83% and 21.66%).

The average scales for the software usage is also shown in Fig. 6.4 Notice that the many peaks are located at fully automated rather semi automated scales. Even the minimum value at fully automated scale is higher than the maximum of the semi automated scales. This indicates that the use of software at SME is very encouraging.

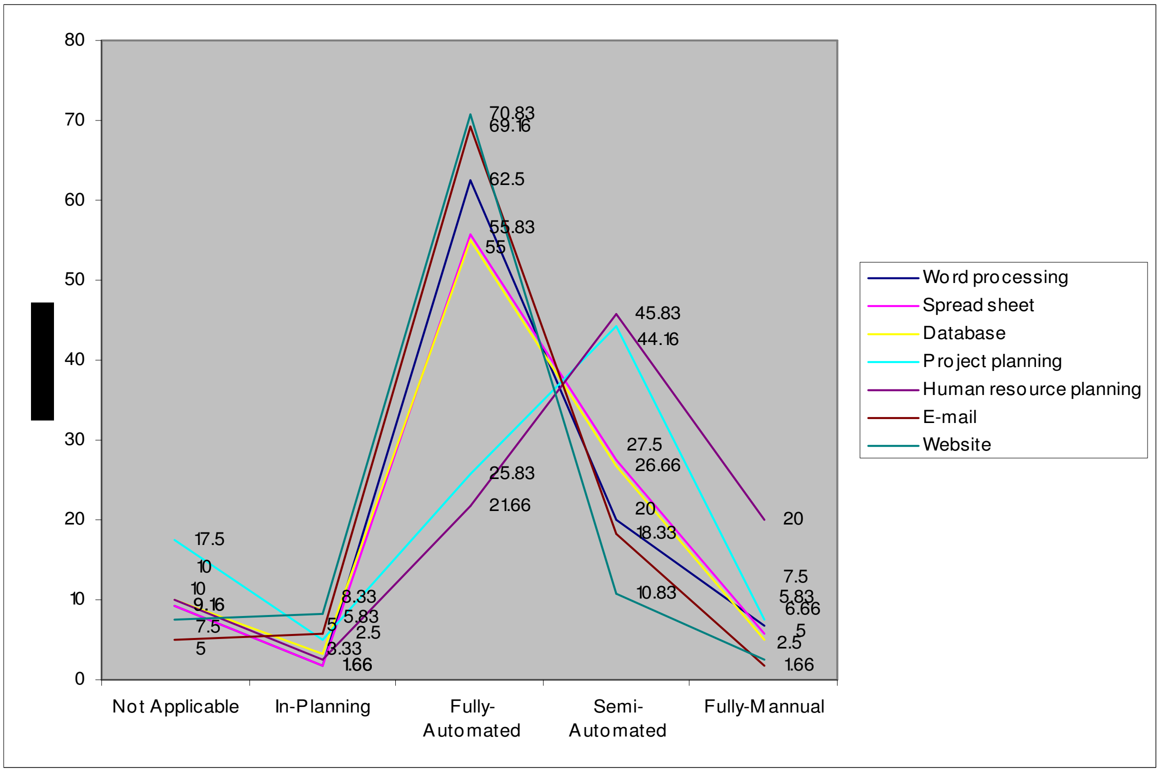

Figure 6.4: The average scales on the use of software in ICT adoption

Further analysis on the correlation between the software usage and the size of employees is carried out to determine the impact on ICT adoption. Based on the results exhibited in Table 6.6, most of the software usage is not significant except for human resource planning (p = 0.030). This implies that most software usage is not affected by the size of employees, except for human resource planning.

Table 6.6:
The correlation between the usage of software and the size of employees

Software Usage		**(r)**
Word processing	Correlation Coefficient	-.001
	Sig. (1-tailed)	.495
Spread sheet	Correlation Coefficient	.038
	Sig. (1-tailed)	.339
Database	Correlation Coefficient	-.115
	Sig. (1-tailed)	.106
Project planning	Correlation Coefficient	-.027
	Sig. (1-tailed)	.384
Human resource planning	Correlation Coefficient	-.172*
	Sig. (1-tailed)	.030
E-mail	Correlation Coefficient	.061
	Sig. (1-tailed)	.254
Website	Correlation Coefficient	.028
		.381

* Correlation is significant at the 0.05 level (1-tailed).

Further investigation using partial correlation matrix shows that five items in group administration such as purchasing, tender, cost/expenses, bookkeeping, and HRM was tested. Findings shows that three items such as cost/expenses (0.512) and HRM (0.515) have a significant correlation with the tender activity. The results also indicate that level of cost or expenses and HRM does influence degree of tender activities.

Furthermore, partial correlation matrix also indicates that a significant positive correlation coefficient of 0.676 between material control and scheduling, material control and inventory control with correlation coefficient of 0.338. On the other hand, a result also indicates that product development is positive correlation coefficient of 0.484 with production operation. This may suggest that product development is an important activity and affected to the production operation in the firms.

Thus, Supplies activity and distribution show a significant positive correlation coefficient of 0.398. This study also suggests that forecasting and marketing/advertising indicate a strongly significant positive correlation of coefficient 0.389. This results indicate that a strong support and in line with earlier findings in terms of ICT adoption. Most of the SME's, involved in supply chain management particularly in material control and inventory management.

6.5 Technology Adoption

In order to find the significant interaction between technology adoption and size of employee based on stand alone technology, intermediate technology and integrated technology, correlation analysis and partial correlation matrix are carried out with size of employees and technology adoption are displayed in Table 6.7, Table 6.8, and Table 6.9.

Table 6.7:
Correlations between the size of employees and stand alone-technology adoption

Stand alone technology adoption		**(r)**
Computer-aided design (CAD)	Correlation Coefficient	.292**
	Sig. (1-tailed)	.001
Computer-aide process planning (CAPP)	Correlation Coefficient	.264**
	Sig. (1-tailed)	.002
Numerical control/computer numerical control(NC/CNC) digital numerical control (DNC) machines	Correlation Coefficient	.312
	Sig. (1-tailed)	.000
Pick-and-places robots	Correlation Coefficient	.425**
	Sig. (1-tailed)	.000
Others robots	Correlation Coefficient	.352**
	Sig. (1-tailed)	.000
Material working laser	Correlation Coefficient	.323
	Sig. (1-tailed)	.000
	Correlation Coefficient	

** Correlation is significant at the 0.05 level (1-tailed).

Table 6.8:
Correlations between the size of employees and intermediate technology adoption

Intermediate technology adoption		**(r)**
Storage and retrieval system (ASRS)	Correlation Coefficient	.287**
	Sig. (1-tailed)	.001
Material handling system (AMHS)	Correlation Coefficient	.298**
	Sig. (1-tailed)	.000
Inspection and testing equipment	Correlation Coefficient	.284**
	Sig. (1-tailed)	.001

** Correlation is significant at the 0.05 level (1-tailed).

Table 6.9:
Correlations between the size of employees and integrated technology adoption

Integrated technology adoption		**(r)**
Flexible manufacturing cell system (FMC/FMS)	Correlation Coefficient	.409**
	Sig. (1-tailed)	.000
Computer-integrated manufacturing (CIM)	Correlation Coefficient	.388**
	Sig. (1-tailed)	.000
Material requirement planning (MRP)	Correlation Coefficient	.354**
	Sig. (1-tailed)	.000
Just-in-time	Correlation Coefficient	.379**
	Sig. (1-tailed)	.000
Manufacturing resources planning	Correlation Coefficient	.474**
	Sig. (1-tailed)	.000

** Correlation is significant at the 0.05 level (1-tailed).

The type of technology adoption was divided by three categories such as stand alone technology, intermediate technology and integrated technology. The extension correlation analysis was using partial correlation matrix to analyses whether each item in each group technology indicate some degree of validity that shall provide useful information of interaction between items.

Results in Table 6.7 shows that size of employee based on the stand-alone technology adoption such us CAD (P=0.001), CAPP (P=0.002), CNC (P=0.000), pick and place robots (P=0.000), other robots (P=0.000) and Material working laser (P=0.000) have a significant correlation at 1 percent level respectively. Hence, results in Table 6.8 shows that size of employee based on the intermediate technology adoption such us ASRS (P=0.001), AMHS (P=0.000) and Inspection and testing equipment (P=0.001) have a significant correlation at 1 percent level. Results in Table 6.9 show that size of employee based on integrated technology such as FMC/FMS (P=0.000), CIM (P=0.000) and MRP1 (P=0.000), JIT (P=0.000) and MRP2 (P=0.000) have significant correlations at 1 percent level respectively .

Further investigation shows that a significant positive correlation coefficient of 0.515 between Computer-Aided Design (CAD) and Computer Aided Process Planning (CAPP). Apart from that, Pick and Place Robots and other robots show a significant positive correlation coefficient of 0.483. This shows that each item is very important and accompaniment each other in terms of firms involved in electronic and high tech industries.

6.6 Training Programs

In order to find the significant interaction between training programs and size of employee based on Administration Training, Operation Training, Stand Alone Technology training, Intermediate Technology Training and Integrated Technology Training the correlation analysis and partial correlation matrix were used and the results are exhibited Table 6.10, 6.11, 6.12, 6.13 and 6.14.

Table 6.10:
Correlations between the size of employees and administration training programs

Administration training programs		**(r)**
Information technology	Correlation Coefficient	.230**
	Sig. (1-tailed)	.006
Job base training	Correlation Coefficient	.232**
	Sig. (1-tailed)	.005
Customer service/public relations	Correlation Coefficient	-.012
	Sig. (1-tailed)	.449
Marketing/publicity	Correlation Coefficient	.049
	Sig. (1-tailed)	.297
Training/refresher courses	Correlation Coefficient	.213**
	Sig. (1-tailed)	.010
Management skills	Correlation Coefficient	.141
	Sig. (1-tailed)	.062

** Correlation is significant at the 0.05 level (1-tailed).

Table 6.10 shows the correlation between employee size and the following independent variables: information technology (IT), job base training, customer service/public relations, marketing/publicity, training/refresher courses, and management skills.

As the data disclosed, three variables had a positive and statistically significant correlation to employee size, namely (a) IT, (b) job base training, and (c) training/refresher courses. Of these variables, job base training had the strongest positive correlation, as shown by the r-value of 0.232 ($p = 0.005$). This was closely followed by IT, with an r-value of 0.230 ($p = 0.006$), then training/refresher courses ($r = 0.213$, $p = 0.010$).

The findings suggest that size of the company contributes significantly to the amount of training-related activities in the areas of IT, job base training, and training/refresher courses. It may also be said that the more employees there are in the company, the higher is the demand for activities specifically on information technology, the need to widen job-based training as well as for training/refresher courses. Larger companies tend to have more training activities when compared to smaller companies, and that job-based training is more in demand when compared to IT and training/refresher courses.

Hence, result in Table 6.11 shows the correlation between size of employee based on ICT adoption in operation training programs. Generally, majority respondents in terms of size employee involved in ICT adoption are operation training programs except project management, invoice/billing marketing/advertising, credit control, customer services and fixed asset management.

There are significant correlation training programs involved with the size of employee based on ICT adoption in operation activities such as Material Control (P=0.000), Scheduling (P=0.010), Selling (P=0.013), Product Development (P=0.002), Product Operation (P=0.001), Human Resource Recruitment (P=0.000), Distribution (P=0.043), Supplies (P=0.018), Engineering (P=0.000) and finally Forecasting training (P=0.003) were significantly at 1 per cent and 5 per cent level respectively. Hence, Customer service training, marketing training and management skill training is not correlated significantly with size of employee based on ICT adoption.

Table 6.11:
Correlations between the size of employees and operation training programs

Operations training programs		**(r)**
Material control	Correlation Coefficient	.386**
	Sig. (1-tailed)	.000
Scheduling	Correlation Coefficient	.213**
	Sig. (1-tailed)	.010
Selling	Correlation Coefficient	.204*
	Sig. (1-tailed)	.013
Product development	Correlation Coefficient	.255**
	Sig. (1-tailed)	.002
Production operation	Correlation Coefficient	.280**
	Sig. (1-tailed)	.001
Human resource recruitment	Correlation Coefficient	.303**
	Sig. (1-tailed)	.000
Project management	Correlation Coefficient	.118
	Sig. (1-tailed)	.100
Distribution	Correlation Coefficient	.157*
	Sig. (1-tailed)	.043
Supplies	Correlation Coefficient	.193*
	Sig. (1-tailed)	.018
Invoice/billing	Correlation Coefficient	.105
	Sig. (1-tailed)	.127
Marketing/advertising	Correlation Coefficient	.097
	Sig. (1-tailed)	.146
Credit control	Correlation Coefficient	.067
	Sig. (1-tailed)	.235
Customer service	Correlation Coefficient	.124
	Sig. (1-tailed)	.088
Engineering	Correlation Coefficient	.426**
	Sig. (1-tailed)	.000
Fixed asset management	Correlation Coefficient	.145
	Sig. (1-tailed)	.057
Inventory control	Correlation Coefficient	.186*
	Sig. (1-tailed)	.021
Forecasting	Correlation Coefficient	.249**
	Sig. (1-tailed)	.003

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.05 level (1-tailed).

Table 6.11 shows the correlation between the various operation activities and employee size. As can be seen, eleven variables had a positive correlation to employee size, with seven variables had correlations at 0.01 level of significant, whilst the remaining four at 0.05 level of significant. In the order of highest positive correlation, Engineering operations appears to have the strongest correlation at r = 0.426 (p = 0.000). This is followed by Material Control with an r-value of 0.386 (p = 0.000), Human Resource Recruitment (r = 0.303, p = 0.000), Production Operation (r = 0.280, p = 0.001), Product Development (r = 0.255, p = 0.002), Forecasting (r = 0.249, p = 0.003), Scheduling (r = 0.213, p = 0.010), Selling (r = 0.204, p = 0.013), Supplies (r = 0.193, p = 0.018), Inventory Control (r = 0.186, p = 0.021), and Distribution (r = 0.157, p = 0.043). For the rest of the operation activities, such as Project Management, Invoice/Billing, Marketing/Advertising, Credit Control, Customer Service, and Fixed Asset Management, the data suggests no evidence of significant correlations with employee size.

The findings suggest the size of the company is related significantly to the Operations training activities in the areas of Engineering, Material Control, Human Resource Recruitment, Production Operation, Product Development, Forecasting, and Scheduling. To a lesser extend, the other Operation training such as Selling, Supplies, Inventory Control, and Distribution are also related to the size of the company at significant levels of at least 0.05. It is interesting to note that most of the highly correlated training came from operational areas in the production and manufacturing. This suggests that larger companies tend to have highly complex and sophisticated production and manufacturing activities, perhaps involving high-technology machineries that require large amount of training.

Looking at the magnitude of correlation, it appeared that engineering, material control, and human resource recruitment were the variables that demonstrated the strongest correlation to employee size. Likewise, the positive correlations to employee size of these and all other variables indicate that larger enterprises tended to have more needs of, or demands for, training on engineering, material control, and human resource recruitment, among others. These elevated needs or demands may be rationalized by the bulk of business operations that larger organizations had to contend with in dealing with customers, workers, and the public at large when compared to smaller businesses. The findings may also suggest that larger organizations, such as those involved in the present research, were very much engaged in operations training that dealt with the variables that were statistically significantly correlated to employee size. Put it simply, employee size had a significant bearing on operations training, more specifically on the preceding variables mentioned.

The correlations between the various Stand Alone Technology products and size of company show positive and significant correlations in all the stand alone products at $p = 0.001$ level of significant. The highest correlation is Numerical Control/Computer Numerical Control NC/CNC machines with an r-value of 0.314. Next is Robots with an r-value of 0.293 for Other Robots category, and an r-value of 0.288 for Pick-and-place Robots. This is followed by Computer-Aided Process Planning (CAPP) at $r = 0.284$, Computer-Aided Design (CAD) at $r = 0.274$, and Material Working Laser at $r = 0.225$.

The positive correlations suggest that larger companies had more inclination to utilize the preceding forms of stand-alone technology when compared to smaller enterprises. Understandably, big companies may have business operations that require special or unique stand-alone technologies that may not be at all necessary in smaller entities. See Table 6.12.

Table 6.12:
Correlations between the size of employees and stand alone technology training programs

Stand alone technology training programs		**(r)**
Computer-aided design (CAD)	Correlation Coefficient	.274**
	Sig. (1-tailed)	.001
Computer-aide process planning (CAPP)	Correlation Coefficient	.284**
	Sig. (1-tailed)	.000
Numerical control/computer numerical control(NC/CNC) digital numerical control (DNC) machines	Correlation Coefficient	.314**
	Sig. (1-tailed)	.000
Pick-and-places robots	Correlation Coefficient	.288**
	Sig. (1-tailed)	.001
Others robots	Correlation Coefficient	.293**
	Sig. (1-tailed)	.001
Material working laser	Correlation Coefficient	.225**
	Sig. (1-tailed)	.007
	Correlation Coefficient	

** Correlation is significant at the 0.05 level (1-tailed).

Similar to Stand Alone Technology (see Table 6.13), all products categorized under the Intermediate Technology also had highly positive correlations with size of the employee. Topped the list is Automatic Storage and Retrieval Systems (AS/RS) with an r-value of 0.333. This is followed closely by Automated Material Handling System

(AMHS) at r = 0.326, and Fully Automated Inspection and Testing Equipment (FAITE) at r = 0.260. All three intermediate technology products are significant at the 0.001 level.

Table 6.13:
Correlations between the size of employees and intermediate technology training programs

Intermediate technology training programs		**(r)**
Storage and retrieval system (ASRS)	Correlation Coefficient	.333**
	Sig. (1-tailed)	.000
Material handling system (AMHS)	Correlation Coefficient	.326**
	Sig. (1-tailed)	.000
Inspection and testing equipment	Correlation Coefficient	.260**
	Sig. (1-tailed)	.002

** Correlation is significant at the 0.05 level (1-tailed).

The positive correlations suggest that the larger the company, the more that they would require intermediate technologies such as AS/RS and AMHS, and to utilize full automation in inspection and testing equipment when compared to smaller companies. The need for intermediate technologies may be expected as larger companies would tend to require AS/RS, AMHS, and fully automated inspection and testing equipment in their business operations when compared to smaller companies.

In addition to stand-alone and intermediate technologies (see Table 6.14), this research also found statistically significant correlations between employee size and integrated technologies, in particular, flexible manufacturing cell systems (FMS), computer-integrated manufacturing (CIM), material requirement planning (MRP), jut-in-time (JIT), manufacturing, and manufacturing resources planning (MRP11). This finding is supported by p-values which were all statistically significant at the 0.01 significance level. In terms of the strength of correlation, MRP (r = 0.414) tended to have the strongest relationship with employee size, implying that this is the foremost type of integrated technology that larger companies would need and utilize in their business operations when compared to smaller companies which may not need often such technology.

Table 6.14:
Correlations between the size of employees and integrated technology training programs

Integrated technology training programs		**(r)**
Flexible manufacturing cell system (FMC/FMS)	Correlation Coefficient	.339**
	Sig. (1-tailed)	.000
Computer-integrated manufacturing (CIM)	Correlation Coefficient	.286**
	Sig. (1-tailed)	.001
Material requirement planning (MRP)	Correlation Coefficient	.414**
	Sig. (1-tailed)	.000
Just-in-time	Correlation Coefficient	.281**
	Sig. (1-tailed)	.001
Manufacturing	Correlation Coefficient	.392**
	Sig. (1-tailed)	.000
Manufacturing resources planning	Correlation Coefficient	.358**
	Sig. (1-tailed)	.000

** Correlation is significant at the 0.05 level (1-tailed).

Nevertheless, all other forms of integrated technology considered in this study also had a statistically significant correlation with employee size, suggesting their relative importance to the operations of larger companies when compared to that of smaller companies. As larger companies may have a much wider spectrum of business activities, operational needs, and strategic actions, the need to utilize integrated technologies in their business operations is much more necessary than smaller companies.

The findings show that in the high-technology areas, all the products listed under the Stand Alone, Intermediate and Integrated technologies are significant and positively correlated to the size of the company. These suggest that larger sized companies tend to use automation and high technology products to support their operations. This also indicates that companies today are embarking on automation to increase productivity, and quality and precision of their products to enable them to compete and sustain their profitability.

6.7 Types of Business

The SMEs that have their own websites were analyzed further. The average scales are presented in Table 6.15. The results indicate that SMEs did not use their website often to communicate between business to business, business to customer and business to government. This statement is supported by the graph illustrated in Figure 6.5 and Table 6.14, where the peaks for the three types of business are shown at “seldom” scale. Notice also, business to government scored the highest average scale for “seldom” and furthermore score the least for “frequently” scale. The least difference in “seldom” and “frequently” scales are shown by business to customer graph.

Table 6.15:
Cross-tabulation between the use of software and the size of employees

Frequency of Use	Business to business	Business to customer	Business to government
None	**21.66**	**20.00**	**25.83**
Seldom	**29.16**	**24.16**	**34.16**
Sometimes	**22.50**	**21.66**	**25.83**
Often	15.83	15.83	9.16
Frequently	10.83	18.33	5.00

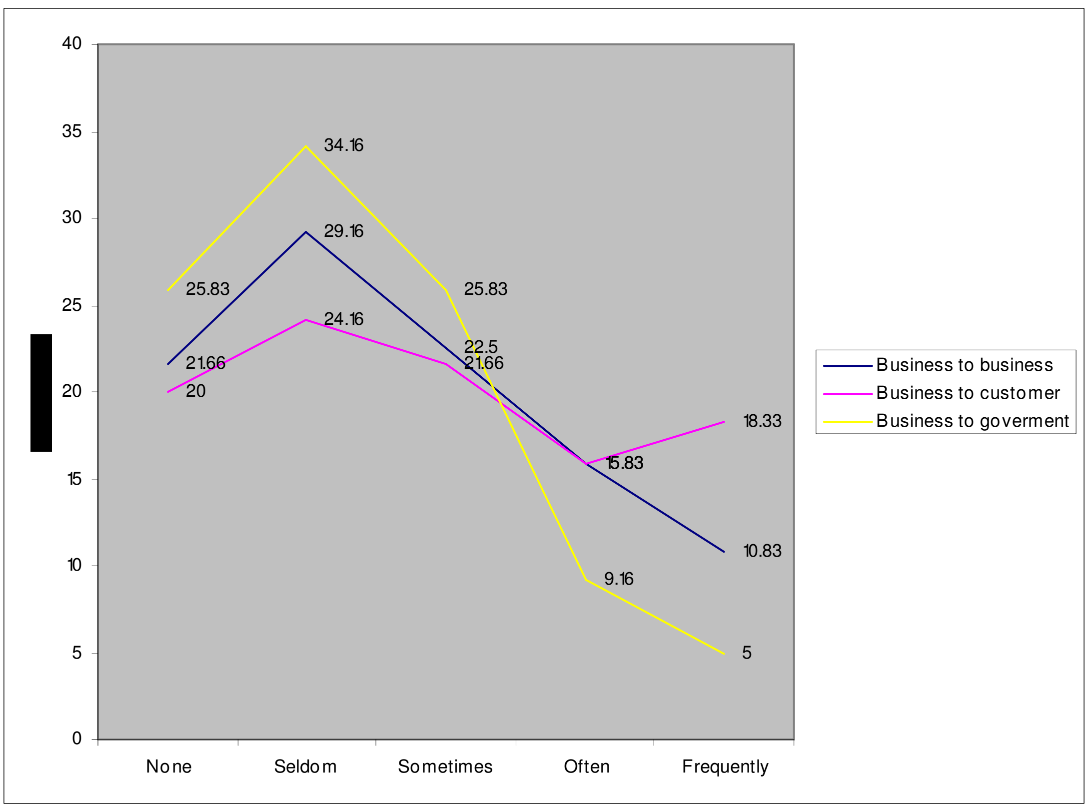

Figure 6.5: Cross-tabulation Between The Use Of Software And The Size Of Employees

Finally, the correlation between the software usage and the size of employees is carried out, and the results are shown in Table 6.16.

Table 6.16:
Correlation between software usage and size of employees

Software Usage		**(r)**
Business to business	Correlation Coefficient	.242**
	Sig. (1-tailed)	.004
Business to customer	Correlation Coefficient	.125
	Sig. (1-tailed)	.087
Business to government	Correlation Coefficient	.152*
	Sig. (1-tailed)	.048

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

The correlation results indicate that business to business ($p = 0.004$) and business to government ($p = 0.048$) have significant correlation with the size of employees.

6.8 Measurement of Company's Productivity

In this study, the company's productivity was measured based on three categories, namely based on (a) production, (b) services or project, and (c) both production and services. The distribution of company involved as respondents with respect to company's productivity is shown in Fig. 6.6. Out of 120 companies, most companies involved were based on services or projects (52 or 62%), followed by companies based on production (27%) and companies based on both services and production (11%).

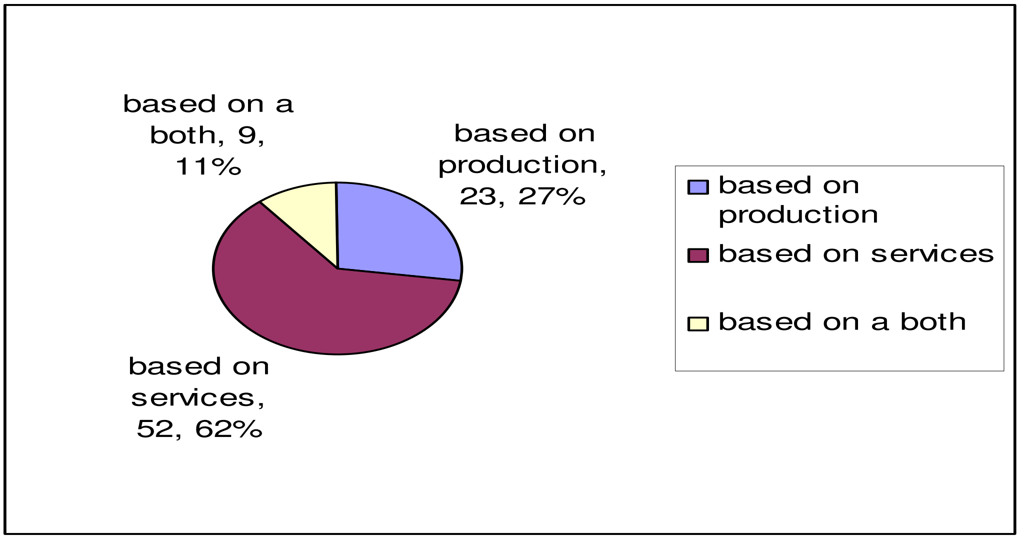

Figure 6.6: The measurement of company's productivity based on three categories

Each category of company's productivity is further analyzed and described in the following subsections.

a) Based on Production

To describe the effect of company productivity based on services after the adoption of technology and ICT, each item in the questionnaire with regard to company's productivity is further analyzed. The average score of 23 companies for each item is depicted in Fig. 6.7.

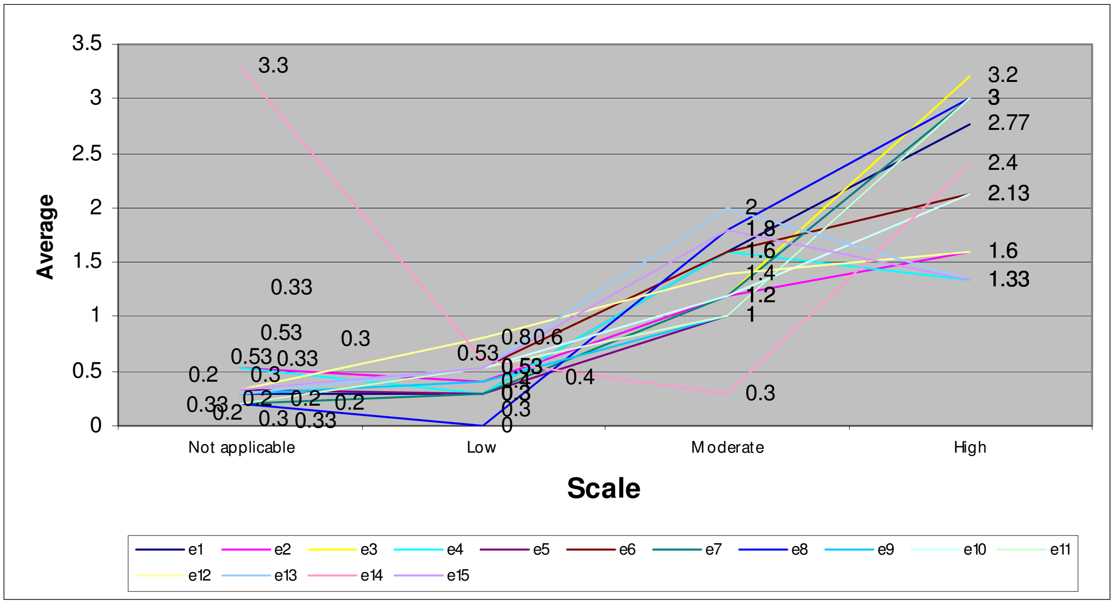

Figure 6.7: Graphical representation of company's productivity based on production

A total of six items obtain average *High* scale of at least 3.0 points. The highest average scale is achieved by 3.2, and the item corresponding to this is ***e3***. This indicates that average adoption of technology and ICT has increased the revenue from manufacturing operation. The second strong impact of technology and ICT adoption is the ability to fulfill a product demand, ability to enhance knowledge and skill of the workers, ability to increase quality of services (3 out of 4).

Closer observation of Fig. 6.7 and Table 6.17 indicates that scale *Not applicable* of *item e14* scores an average of 3.3 points (see also Table 2). The results also reveal that the technology and ICT adoption did not reduce the time between conceptualization and production of new products.

Table 6.17:
The average scores for each scale of each item in measuring company's productivity based on production

Item	Not applicable	Low	Moderate	High
e1	0.3	0.3	1.6	2.77
e2	0.53	0.4	1.2	1.6
e3	0.2	0.3	1.2	**3.2**
e4	0.53	0.3	1.6	1.33
e5	0.33	0.3	1	3
e6	0.2	0.53	1.6	2.13
e7	0.2	0.3	1.2	3
e8	0.2	0	1.8	3
e9	0.3	0.4	1	3
e10	0.33	0.53	1.2	2.13
e11	0.2	0.53	1	3
e12	0.33	0.8	1.4	1.6
e13	0.3	0.53	2	1.33
e14	3.3	0.6	0.3	2.4
e15	0.33	0.53	1.8	1.33

The rest of the items have an average score between 0.2 to 0.153. The average results of the 15 items also denote that only columns *not applicable* and *hig*h obtained at least an average of 3 and above. Hence, the conclusion based on the average points for each item is summarized in Table 6.18.

Table 6.18:
Items measuring company's productivity based on production that have mean scores of 3.0 and above

Not applicable			High		
e15	Increasing the rate of output of production operator	3.3	e3	Increase in revenues from manufacturing operations	3.2
			e5	Ability to improve product quality	3.0
			e7	Ability to fulfill a product demand	3.0
			e8	Ability to enhance knowledge and skill of the workers	3.0
			e9	Ability to increase quality of services	3.0
			e11	Ability to increase quantity and quality of services	3.0

Further analysis on correlations between size of employees and the impact of technology and ICT based on production is presented in Table 6.19. The items are arranged in the ascending order with the smallest significant value, followed by the second and the rest.

Table 6.19:
Correlation between employee size and the impact of technology and ICT based on production

Item	Question	Significant value
e10	Reducing to zero defect	0.007
e13	Reduction in production change over time	0.016
e6	Reduction in per unit labor cost	0.033

Note that items that have high average scales do not have significant correlation with size of employees. The results presented in Table 6.17 and 6.18 also indicate that items e3, e5, e7, e8, e9 and e11b would not be affected if the number of employees is decreasing or otherwise. One important point to realize is that the size of employees has strong implications on items such as *reducing to zero defect*, *reducing in production change over time* and *reducing in per unit labor cost*. Hence, if these three items become the main targets, the adoption of technology and ICT is vital in a particular organization.

b) Based on Services or Project

To describe the effect of company's productivity not based on production after the adoption of technology and ICT, a total of 23 respondents was collected. In effect, an average scale for each relevant item is calculated. The results displayed in Table 6.20 show that only column *high* scores more than 2 points (out of 4). This implies that most items (*e1* to *e8*) are important, except that *e2* scores low average point (0.5). However, strongest effect of technology and ICT is on the quality of services (2.54). Other important items include increasing operator output rates (average = 2.4), increasing knowledge and skill of the worker (average = 2.3), and also increasing the quantity and the quality of services. Clearly, the graph shown in Fig. 6.8 exhibit 3 items have an average label score of more than 2 points. On the other hand, the effect of technology and ICT does not reduce per unit labor cost (average = 0.5).

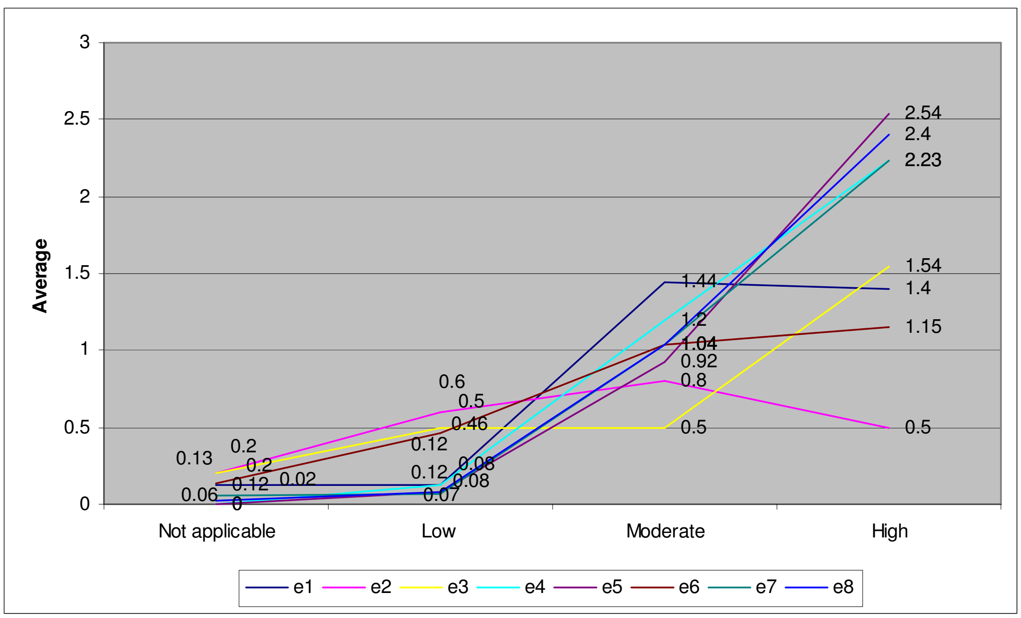

Figure 6.8: Graphical representation of company's productivity based on services

It is interesting to note that five out of eight items of company's productivity obtained more than two points of average scores for label *high*. The highest average score was shown by item ***e3***. This implies that the adoption of technology and ICT enable the company to fulfill a product demand. For completeness, the items that have average scales of more than 2.0 are summarized in Table 6.20.

Item	Not applicable	Low	Moderate	High
e1	0.12	0.12	1.44	1.4
e2	0.2	0.6	0.8	0.5
e3	0.2	0.5	0.5	1.54
e4	0	0.12	1.2	2.23
e5	0	0.08	0.92	2.54
e6	0.13	0.46	1.04	1.15
e7	0.06	0.07	1.04	2.23
e8	0.02	0.08	1.04	2.4

Table 6.20:
The average scores for each scale of each item in measuring company's productivity based on services

Item No.	Item	Average Scales (High)
4	Ability to increase knowledge and skill of the workers	2.23
5	Ability to increase quality of services	2.54
7	Ability to increase quantity and quality of services	2.23
8	Increase operator output rates	2.4

Table 6.21:
The average scores of actual items for company's productivity Not based on production

To complete the analysis, the correlations between the size of employees and the measurements of company's productivity based on services or projects are listed in Table 6.21. Among eight items tested, none of the items has significant correlation with the size of employees at 0.05 significance level**.** However, at 10 percent significance level, two items are significantly correlated with the size of employee. The first item, e5 has a significant value of 0.055 and the second item e8 has a significant value of 0.66. The results indicate that the adoption of technology and ICT with respect to the size of employee has good impact on the quality of services and operator output rates.

Table 6.22:
Correlations Between The Size Of Employees And The Measurements Of Company's Productivity Based On Services Or Projects

Company's Productivity Based On Services		**(r)**
eb1	Correlation Coefficient	-.089
	Sig. (1-tailed)	.265
eb2	Correlation Coefficient	-.103
	Sig. (1-tailed)	.233
eb3	Correlation Coefficient	-.178
	Sig. (1-tailed)	.103
eb4	Correlation Coefficient	-.148
	Sig. (1-tailed)	.147
eb5	Correlation Coefficient	-.244
	Sig. (1-tailed)	.055
eb6	Correlation Coefficient	-.134
	Sig. (1-tailed)	.172
eb7	Correlation Coefficient	-.108
	Sig. (1-tailed)	.223
eb8	Correlation Coefficient	-.212
	Sig. (1-tailed)	.066

c) Based on Services and Not Based on Production

Having described the effect of technology and ICT on companies based on services, and companies not based on production, the next step is to get some insight on the impact on company's productivity based on the third category. The average scales for each item of 52 companies are shown in Table 6.22. Three items have average scales of at least 1.2 and the highest average is 1.23 (see also Fig. 6.9). The results imply that the effect of technology and ICT adoption enables the company to increase quality of services.

Table 6.23:
The average scores for each scale of each item in measuring company's productivity based on services and not based on production

Item	Not applicable	Low	Moderate	High
e1	0.08	0.09	0.3	0.7
e2	0.13	0.09	0.3	0.52
e3	0.13	0	0.13	0.7
e4	0.13	0	0.13	0.86
e5	0.09	0.26	0.3	0.9
e6	0.13	0	0.13	1.04
e7	0.09	0.09	0	1.04
e8	0.04	0	0.3	1.04
e9	0.04	0	0.13	1.2
e10	0.13	0	0	1.04
e11	0.09	0.24	0	1.2
e12	0.08	0.24	0.13	1.04
e13	0.08	0.08	0	1.04
e14	0.08	0.08	0.3	0.52
e15	0.08	0	0.3	0.75
e1	0.04	0.08	0.3	0.96
e2	0.04	0	0.13	1.04
e3	0.04	0.08	0.13	1.04
e4	0.04	0.04	0.13	1.04
e5	0.04	0	0.13	1.23
e6	0.13	0	0	1.04
e7	0.04	0	0.3	1.04
e8	0.09	0	0.13	1.04

Another two important items exhibited in Table 6.23 include ability to increase quality of services as well as ability to increase quantity and quality of services. Results displayed in Table 6.23 also show that average values for scales other than *high* do not even achieve and average of 0.5. Indirectly, the impact of technology and ICT adoption has strong impact on company's productivity of category 3.

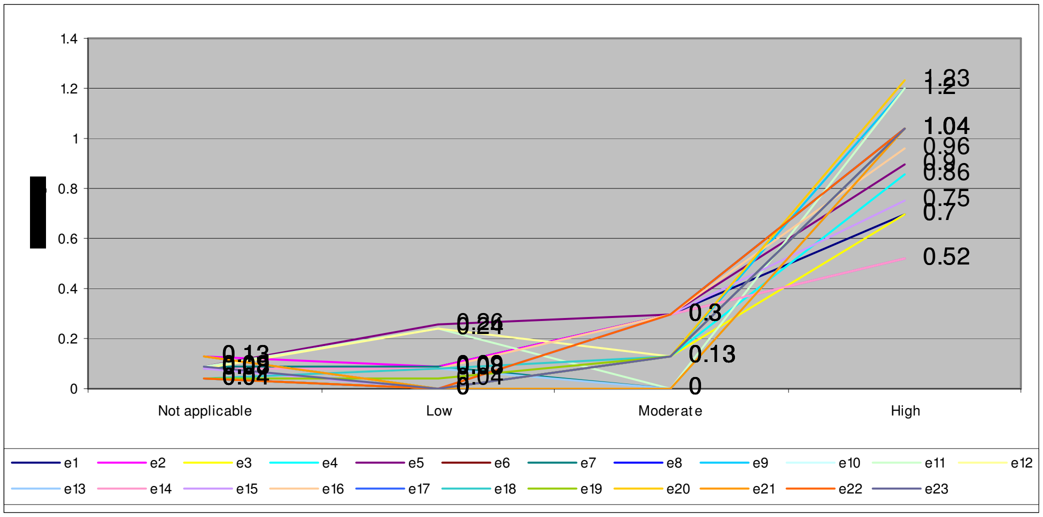

Figure 6.9: Graphical representation of company's productivity based on services and not based on production

Table 6.24:
The Impact Of Technology And ICT Adoption On Company's Productivity

Item	Question	Significant value
e6	Reduction in per unit labor cost	.010
e15	Increase production operator output	.011
e1	Reduction in delivery lead time	.017
e2	Reduction in time for design change for an existing product	.027
e10	Reduction toward zero defect	.040
e6	Reduction in per unit labor cost	.040
e7	Ability to fulfill a product demand	.043
e8	Ability to enhance knowledge and skill of the workers	.043
e13	Reduction in production changeover times	.043
eb2	Reduction in time for design changes for an existing product	.043
eb8	Ability to enhance knowledge and skills of the workers	.043
e14	Reduction in time between conceptualization and production of new product	.047

6.9 The Impact of Training Programs To The Company's Productivity

To describe further the effect of Training programs on company's productivity was divided by production based, Services Based and combination between production and services.

a) Based on Production

To describe the effect of company productivity based on production after the administration training is exhibited in Table 6.25. The results show that information technology and marketing/publicity under the administration training has significant correlation on company's productivity at 0.05 level.

Table 6.25: The Correlation of Administration Training on Company's Productivity

Types of Training		**(r)**
Information technology	Pearson Correlation	**.455(*)**
	Sig. (1-tailed)	.014
Job base training	Pearson Correlation	.214
	Sig. (1-tailed)	.164
Customer service/public relations	Pearson Correlation	.164
	Sig. (1-tailed)	.227
Marketing/publicity	Pearson Correlation	**.361(*)**
	Sig. (1-tailed)	.045
Training/refresher courses	Pearson Correlation	.233
	Sig. (1-tailed)	.142
Management skills	Pearson Correlation	.170
	Sig. (1-tailed)	.219

* Correlation is significant at the 0.05 level (1-tailed).

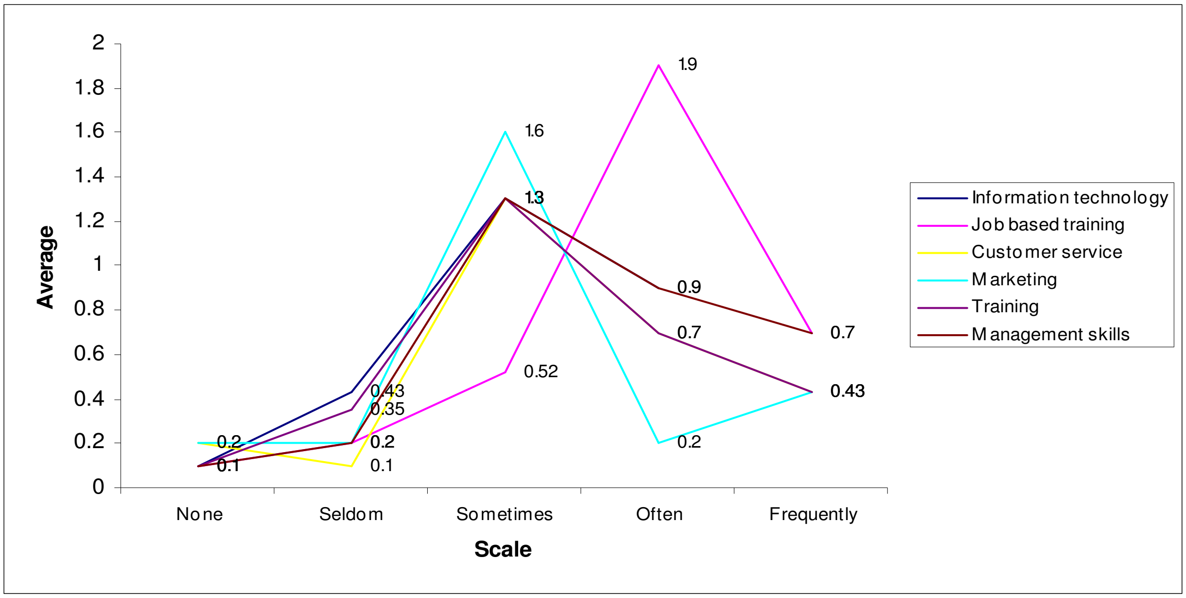

Figure 6.10: Graphical representation average scale of company's productivity based on Administration Training

The results exhibited in Fig. 6.10 indicate that the highest average scale company's productivity based on administration training are shown at "***Often***" scale and 1.9 points level. The item corresponding to this is Job based training. The second highest average score is marketing training at "***Sometimes***" scale and 1.6 points.

To describe the effect of company productivity based on production after the operation training is depicted in Table 6.26. The results indicate that operation training includes material control, production operation, invoice/billing, credit control, engineering, fixed asset management training and inventory control has correlation to the company's productivity significantly at 0.01 per cent level. Therefore, the other operation training such as scheduling, selling , distribution, marketing and forecasting also show significant contribution to the company's productivity at 0.05 per cent level.

Table 6.26:
The Correlation of Operation Training on Company's Productivity

Types of Training		**(r)**
Material control	Pearson Correlation	.544(**)
	Sig. (1-tailed)	.004
Scheduling	Pearson Correlation	.362(*)
	Sig. (1-tailed)	.045
Selling	Pearson Correlation	.420(*)
	Sig. (1-tailed)	.023
Product development	Pearson Correlation	.285
	Sig. (1-tailed)	.094
Production operation	Pearson Correlation	.542(**)
	Sig. (1-tailed)	.004
Human resource recruitment	Pearson Correlation	.302
	Sig. (1-tailed)	.081
Project management	Pearson Correlation	.343
	Sig. (1-tailed)	.055
Distribution	Pearson Correlation	.380(*)
	Sig. (1-tailed)	.037
Supplies	Pearson Correlation	.285
	Sig. (1-tailed)	.094
Invoice/billing	Pearson Correlation	.615(**)
	Sig. (1-tailed)	.001
Marketing/advertising	Pearson Correlation	.362(*)
	Sig. (1-tailed)	.045
Credit control	Pearson Correlation	.592(**)
	Sig. (1-tailed)	.001
Customer service	Pearson Correlation	.245
	Sig. (1-tailed)	.130
Engineering	Pearson Correlation	.541(**)
	Sig. (1-tailed)	.004
Fixed asset management	Pearson Correlation	.572(**)
	Sig. (1-tailed)	.002
Inventory control	Pearson Correlation	.526(**)
	Sig. (1-tailed)	.005
Forecasting	Pearson Correlation	.428(*)

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

Further investigation the impact of operation training on company's productivity is exhibited in Fig. 6.12 and Table 6.27.

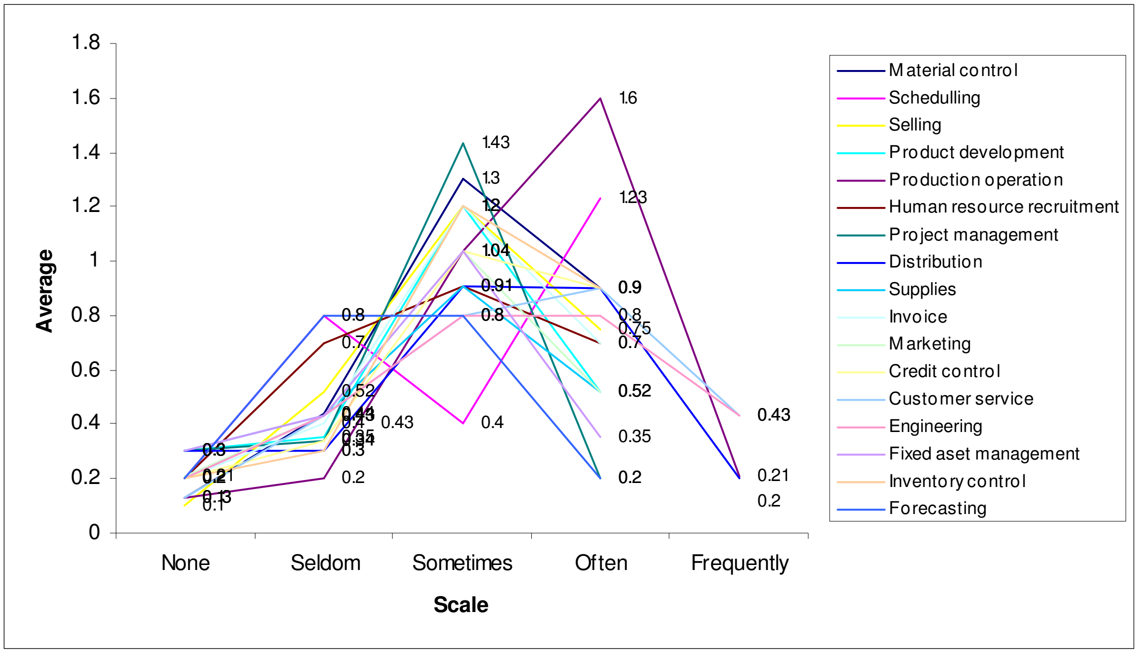

Figure 6.11: Graphical representation average scale of company's productivity based on Operation Training

Table 6.27: Average scale of company's productivity based on Operation Training

Types of Operation Training	None	Seldom	Sometimes	Often	Frequently
Material control	0.13	0.44	1.3	0.9	
Scheduling	0.2	0.8	0.4	1.23	
Selling	0.1	0.52	1.2	0.75	
Product development	0.3	0.35	1.2	0.52	
Production operation	0.13	0.2	1.04	1.6	0.21
Human resource recruitment	0.2	0.7	0.91	0.7	
Project management	0.3	0.34	1.43	0.2	
Distribution	0.3	0.3	0.91	0.9	0.2
Supplies	0.3	0.43	0.91	0.52	
Invoice	0.2	0.4	1.2	0.7	
Marketing	0.21	0.43	1.04	0.52	
Credit control	0.2	0.34	1.04	0.9	
Customer service	0.13	0.43	0.8	0.9	0.43
Engineering	0.2	0.43	0.8	0.8	0.43
Fixed asset management	0.3	0.43	1.04	0.35	
Inventory control	0.2	0.3	1.2	0.9	
Forecasting	0.2	0.8	0.8	0.2	

The highest average scale is achieved by 1.6 points and the item corresponding to this is production operation as shown "*Often*" scale.

Table 6.28: Correlation Between Stand-Alone Technology Training with Company's Productivity

Stand Alone Technology		**(r)**
Computer-aided design (CAD)	Pearson Correlation	.365(*)
	Sig. (1-tailed)	.043
Computer-aided process planning (CAPP)	Pearson Correlation	.323
	Sig. (1-tailed)	.066
Numerical control/computer numerical control NC/CNC/digital numerical control	Pearson Correlation	.406(*)
	Sig. (1-tailed)	.027
Pick-and-place robots	Pearson Correlation	.169
	Sig. (1-tailed)	.220
Others robots	Pearson Correlation	.188
	Sig. (1-tailed)	.195
Material working laser	Pearson Correlation	.114
	Sig. (1-tailed)	.303

* Correlation is significant at the 0.05 level (1-tailed).

The impact of company's productivity based on stand alone technology training was carried out with correlation analysis and depicted in Table 6.28. The results indicate that Computer aided design (CAD) and Numerical Control (NC/CNC) has significant correlation to the company's productivity at 0.01 per cent level. The further analysis exhibited in Fig. 6.12 and Table 6.29 also supports that finding above with similar training at average scale 0.52 points as shown "*Often*" scale.

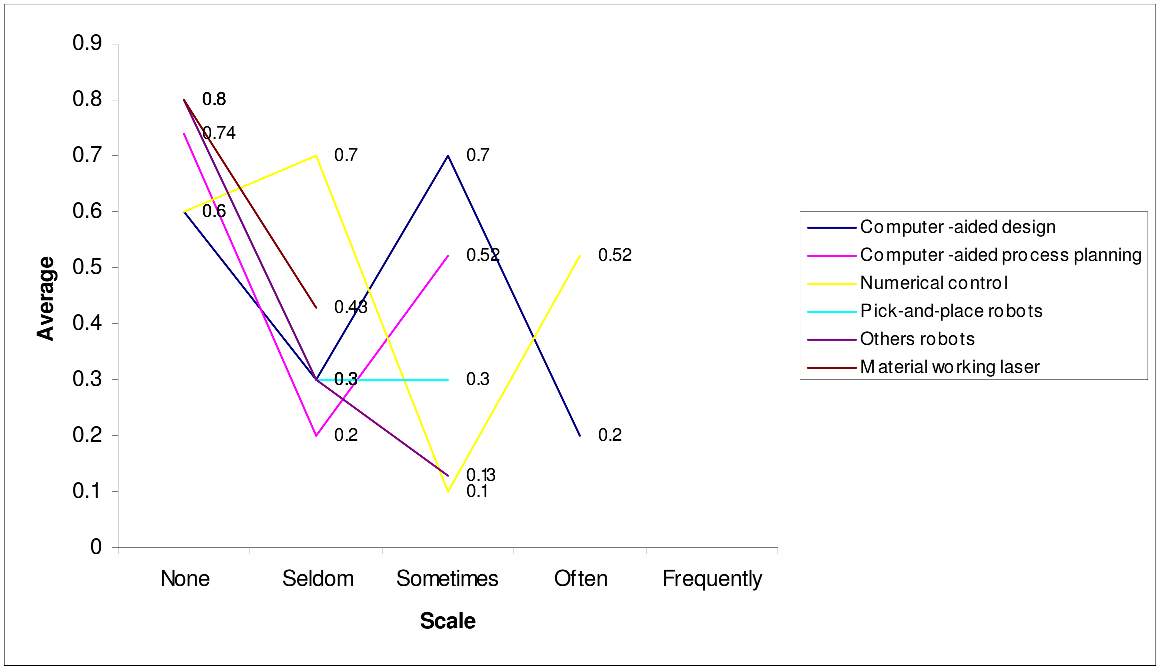

Figure 6.12: Graphical representation average scale of company's productivity based on Stand Alone Technology Training

Table 6.29: Average scale of company's productivity based on Stand Alone Technology Training

Stand-Alone Technology Training	**None**	**Seldom**	**Sometimes**	**Often**	**Frequently**
Computer -aided design	0.6	0.3	0.7	0.2	
Computer -aided process planning	0.74	0.2	0.52		
Numerical control	0.6	0.7	0.1	0.52	
Pick-and-place robots	0.8	0.3	0.3		
Others robots	0.8	0.3	0.13		
Material working laser	0.8	0.43			

The impact of company's productivity based on intermediate technology training was carried out with correlation analysis and exhibited in Table 6.30. The results indicate that all intermediate technology training has significant correlation to the company's productivity at 0.01 per cent level and at 0.05 per cent level. The further analysis exhibited in Fig. 6.13 and Table 6.31.

Table 6.30: Correlation Between Intermediate Technology Training with Company's Productivity

Intermediate Technology Training		**(r)**
Automatic storage and retrievel system (AS/RS)	Pearson Correlation	.529(**)
	Sig. (1-tailed)	.005
Automated material handling system (AMHS)	Pearson Correlation	.434(*)
	Sig. (1-tailed)	.019
Fully automated inspection and testing equipment	Pearson Correlation	.461(*)
	Sig. (1-tailed)	.014

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

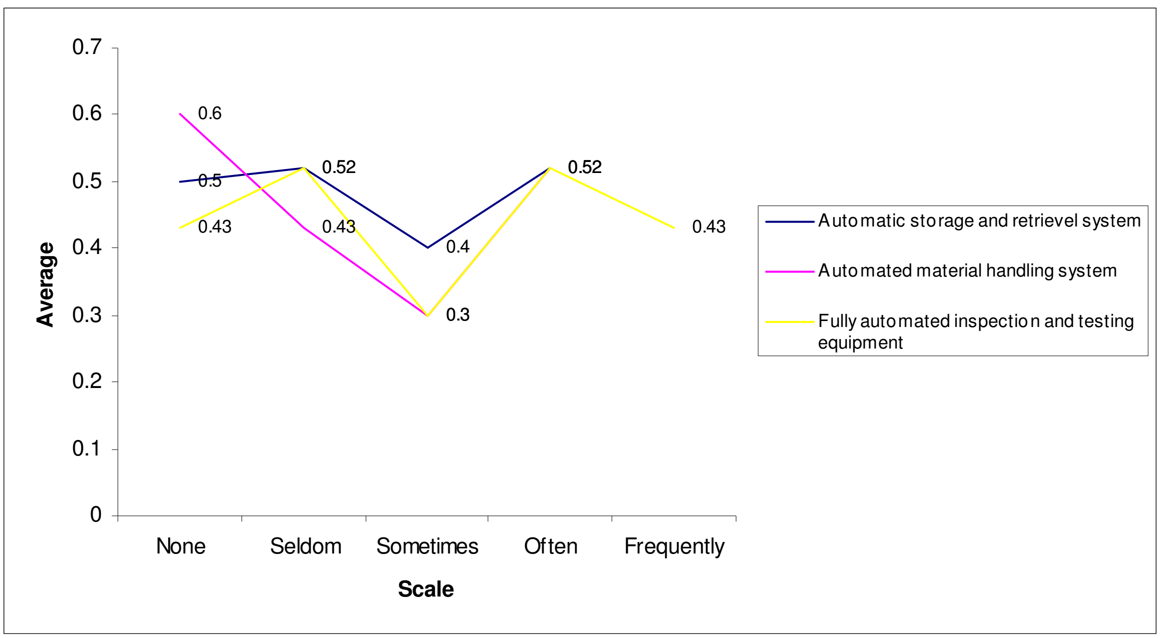

Figure 6.13: Graphical representation average scale of company's productivity based on Intermediate Technology Training

Table 6.31: Average Scale Between Intermediate Technology Training with Company's Productivity

Intermediate Technology Training	**None**	**Seldom**	**Sometimes**	**Often**	**Frequently**
Automatic storage and retrievel system	0.5	0.52	0.4	0.52	
Automated material handling system	0.6	0.43	0.3	0.52	
Fully automated inspection and testing equipment	0.43	0.52	0.3	0.52	0.43

In terms of the impact of company's productivity based on integrated technology training was carried out with correlation analysis and portray in Table 6.31. The results indicate that the strong correlation significantly to the company's productivity at 0.05 per cent level which included Flexible Manufacturing Cell (FMC), Computer Integrated Manufacturing (CIM), and Manufacturing training. The further analysis exhibited in Figure 6.14 and Table 6.32. The results show that the highest peak lies is average scale at 0.8 points and "*Sometimes*" scale.

Table 6.32: Correlation Between Integrated Technology Training with Company's Productivity

Integrated Technology Training		**(r)**
Flexibel manufacturing cell system (FMS)	Pearson Correlation	.401(*)
	Sig. (1-tailed)	.029
Computer-integrated manufacturing (CIM)	Pearson Correlation	.409(*)
	Sig. (1-tailed)	.026
Material requirement planning (MRP)	Pearson Correlation	.338
	Sig. (1-tailed)	.057
Just-in-time (JIT)	Pearson Correlation	.351
	Sig. (1-tailed)	.050
Manufacturing	Pearson Correlation	.408(*)
	Sig. (1-tailed)	.027
Manufacturing resources planning (MRP11)	Pearson Correlation	.399(*)
	Sig. (1-tailed)	.030

* Correlation is significant at the 0.05 level (1-tailed).

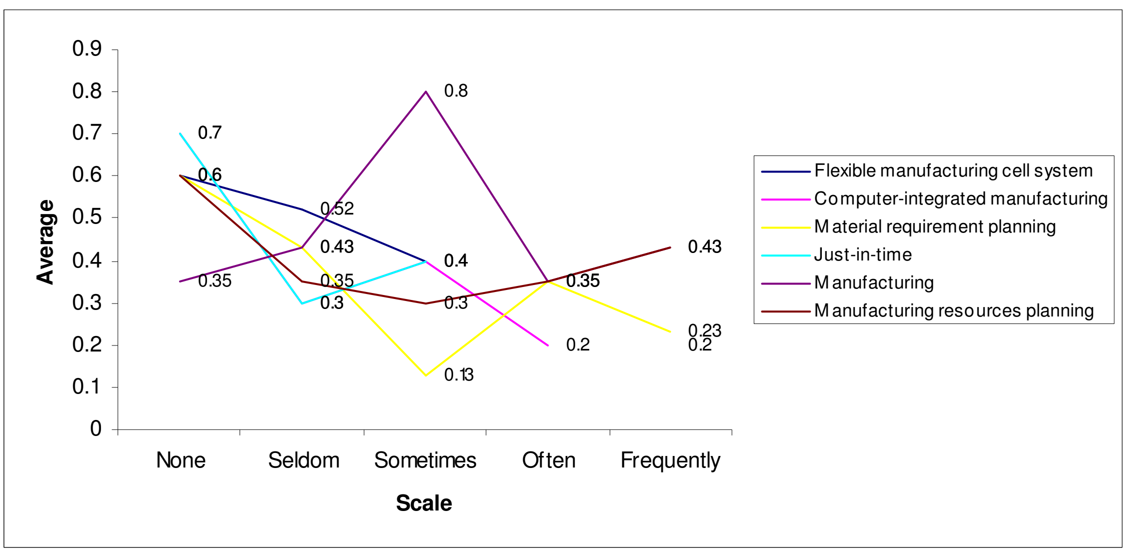

Figure 6.14: Graphical representation average scale of company's productivity based on Integrated Technology Training

Table 6.33: Average Scale Between Integrated Technology Training with Company's Productivity

	None	Seldom	Sometimes	Often	Frequently
Flexible manufacturing cell system	0.6	0.52	0.4		
Computer-integrated manufacturing	0.7	0.3	0.4	0.2	
Material requirement planning	0.6	0.43	0.13	0.35	0.23
Just-in-time	0.7	0.3	0.4		0.2
Manufacturing	0.35	0.43	0.8	0.35	0.43
Manufacturing resources planning	0.6	0.35	0.3	0.35	0.43

b) Based on Services

In terms of company's productivity based on administration training activities and no correlation impact between administration training and productivity and exhibited in Table 6.34, Fig. 6.15 and 6.35.

Table 6.34: Correlation Between Administration Training and Company's Productivity (Services Based)

Types of Administration Training		**(r)**
Information technology	Pearson Correlation	.193
	Sig. (1-tailed)	.085
Job base training	Pearson Correlation	.076
	Sig. (1-tailed)	.296
Customer service/public relations	Pearson Correlation	-.111
	Sig. (1-tailed)	.217
Marketing/publicity	Pearson Correlation	.222
	Sig. (1-tailed)	.057
Training/refresher courses	Pearson Correlation	.184
	Sig. (1-tailed)	.096
Management skills	Pearson Correlation	-.164
	Sig. (1-tailed)	.122

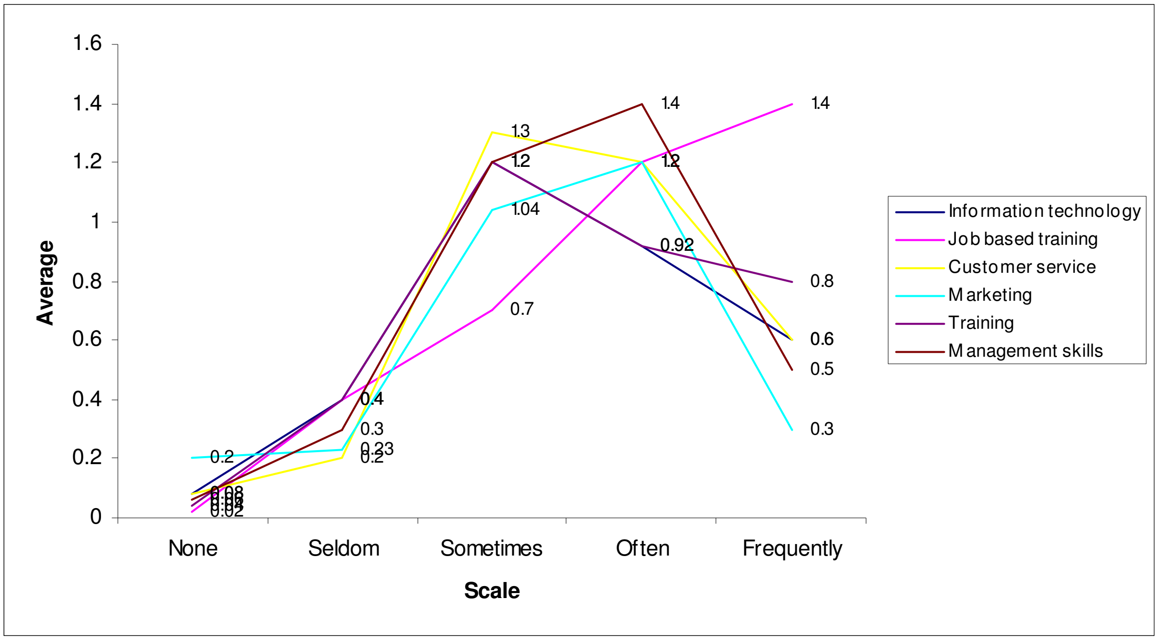

Figure 6.15: Graphical representation average scale of company's productivity based on Administration Training (Services Based)

Table 6.35: Average Scale Between Administration Training and Company's Productivity (Services Based)

Types of Administration Training	None	Seldom	Sometimes	Often	Frequently
Information technology	0.08	0.4	1.2	0.92	0.6
Job based training	0.02	0.4	0.7	1.2	1.4
Customer service	0.08	0.2	1.3	1.2	0.6
Marketing	0.2	0.23	1.04	1.2	0.3
Training	0.04	0.4	1.2	0.92	0.8
Management skills	0.06	0.3	1.2	1.4	0.5

Nevertheless, the correlation between operation training and company's productivity (services based) are exhibited in Table 6.36. The results indicate that product development training (P=0.025), Production operation training (P=0.031) and credit control training (P=0.043) significantly correlation to the company's productivity at 0.05 per cent level. Thus, project management training (P=0.001) also significantly correlation at 0.01 per cent level.

Table 6.36: Correlation Between Operation Training and Company's Productivity (Services Based)

Types of Operation Training		**(r)**
Material control	Pearson Correlation	-.027
	Sig. (1-tailed)	.425
Scheduling	Pearson Correlation	.046
	Sig. (1-tailed)	.373
Selling	Pearson Correlation	.215
	Sig. (1-tailed)	.063
Product development	Pearson Correlation	**.274(*)**
	Sig. (1-tailed)	.025
Production operation	Pearson Correlation	**.261(*)**
	Sig. (1-tailed)	.031
Human resource recruitment	Pearson Correlation	.150
	Sig. (1-tailed)	.145
Project management	Pearson Correlation	**.440(**)**
	Sig. (1-tailed)	.001
Distribution	Pearson Correlation	.195
	Sig. (1-tailed)	.083
Supplies	Pearson Correlation	.214
	Sig. (1-tailed)	.064
Invoice/billing	Pearson Correlation	.043
	Sig. (1-tailed)	.382
Marketing/advertising	Pearson Correlation	.229
	Sig. (1-tailed)	.051
Credit control	Pearson Correlation	**.241(*)**
	Sig. (1-tailed)	.043
Customer service	Pearson Correlation	.188
	Sig. (1-tailed)	.091
Engineering	Pearson Correlation	.222
	Sig. (1-tailed)	.057
Fixed asset management	Pearson Correlation	-.006
	Sig. (1-tailed)	.484
Inventory control	Pearson Correlation	.044
	Sig. (1-tailed)	.377
Forecasting	Pearson Correlation	.118
	Sig. (1-tailed)	.203

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Further analysis exhibited in Fig. 6.16 show that average highest scale is 1.06 points at “Often” scale and the item corresponding to this is customer services. It is also indicates that most of the companies give a priority to the customer satisfaction.

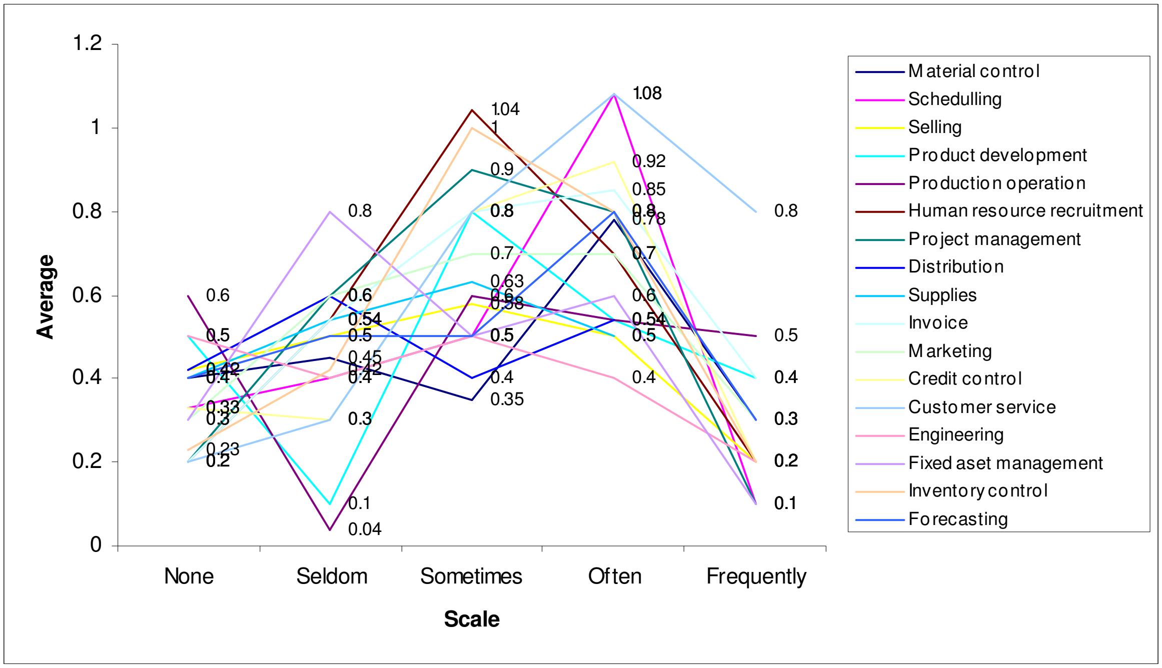

Figure 6.16: Graphical representation average scale of company’s productivity based on Operation Training (Services Based)

The impact of company’s productivity (Services based) based on stand alone technology training was carried out with correlation analysis and depicted in Table 6.37. The results indicate that Computer aided design (CAD) have a significant correlation to the company’s productivity at 0.05 per cent level. The further analysis exhibited in Fig. 6.17.

Table 6.37: Correlation Between Stand-Alone Technology Training and Company's Productivity (Services Based)

Types of Stand Alone Technology Training		**(r)**
Computer-aided design (CAD)	Pearson Correlation	.241(*)
	Sig. (1-tailed)	.043
Computer-aided process planning (CAPP)	Pearson Correlation	.201
	Sig. (1-tailed)	.077
Numerical control/computer numerical control NC/CNC/digital numerical control	Pearson Correlation	.184
	Sig. (1-tailed)	.096
Pick-and-place robots	Pearson Correlation	.160
	Sig. (1-tailed)	.129
Others robots	Pearson Correlation	.100
	Sig. (1-tailed)	.241
Material working laser	Pearson Correlation	.084
	Sig. (1-tailed)	.278

* Correlation is significant at the 0.05 level (1-tailed).

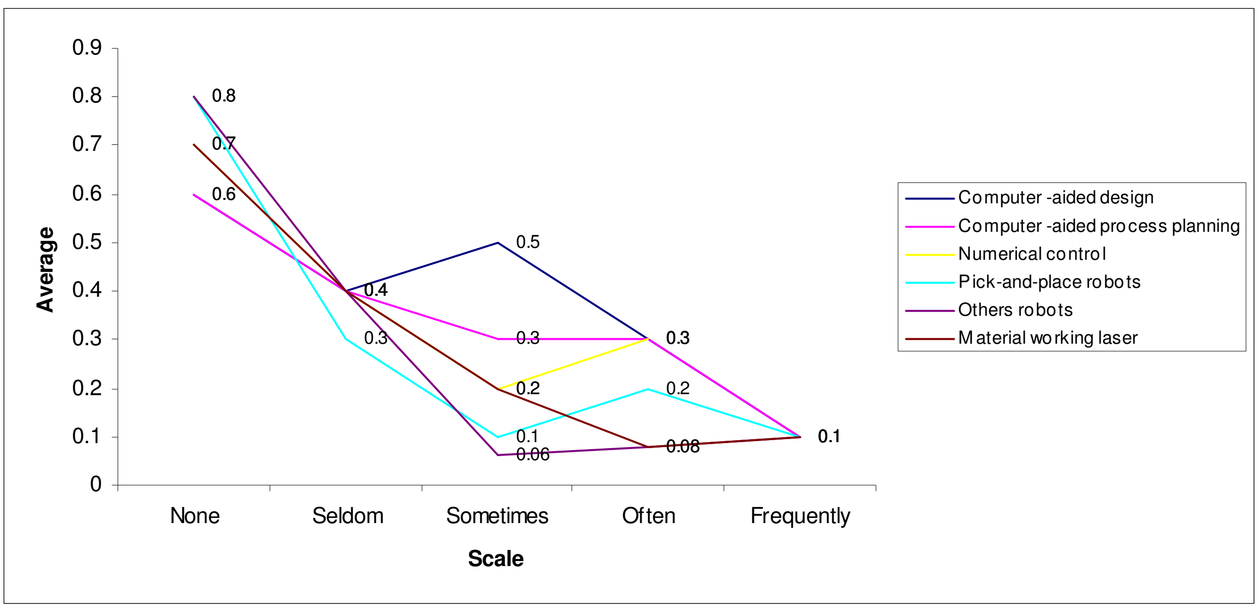

Figure 6.17: Graphical representation average scale of company's productivity based on Stand-Alone Technology Training (Services Based)

The effect of company's productivity based on intermediate technology training was carried out with correlation analysis and depicted in Table 6.38. The results indicate that Automatic storage and Retrieval system (AS/RS) have a significant correlation to the company's productivity at 0.05 per cent level.

Table 6.38: Correlation Between Intermediate Technology Training and Company's Productivity (Services Based)

Types of Integrated Technology Training		**(r)**
Automatic storage and retrievel system (AS/RS)	Pearson Correlation	**.255(*)**
	Sig. (1-tailed)	.034
Automated material handling system (AMHS)	Pearson Correlation	.186
	Sig. (1-tailed)	.093
Fully automated inspection and testing equipment	Pearson Correlation	.223
	Sig. (1-tailed)	.056

* Correlation is significant at the 0.05 level (1-tailed).

The further analysis exhibited in Fig. 6.18 show that the lowest averages scale at 0.1 points with "Sometimes" scale.

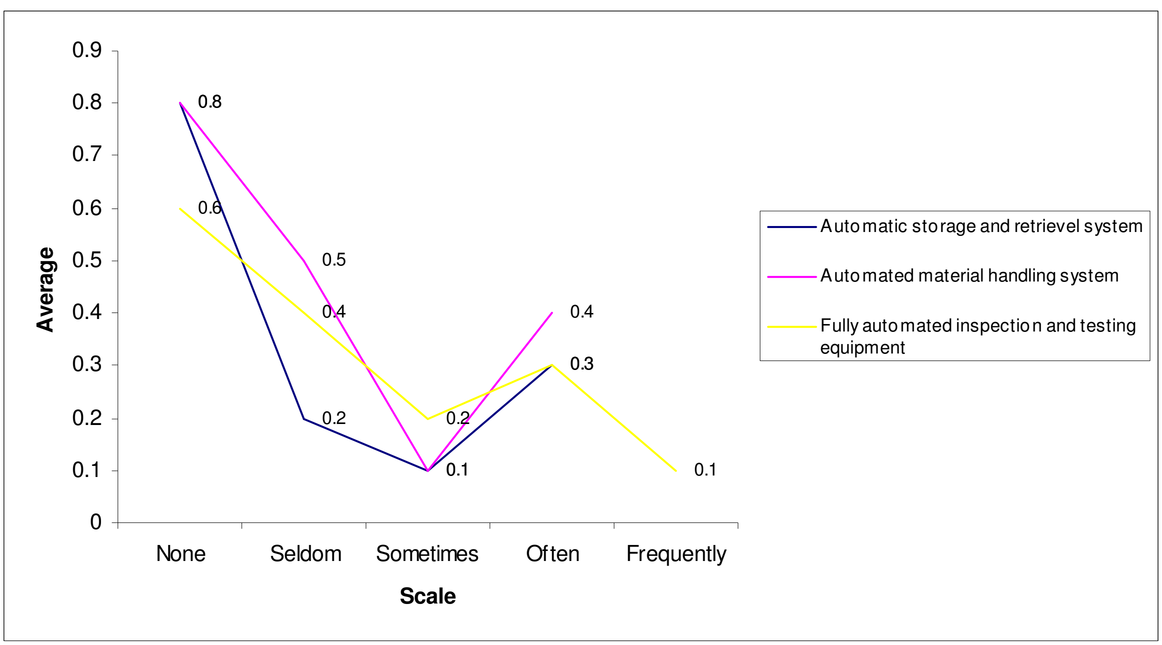

Figure 6.18: Graphical representation average scale of company's productivity based on Intermediate Technology Training (Services Based)

In terms of the impact of company's productivity (services based) based on integrated technology training was carried out with correlation analysis and portray in Table 6.39. The results indicate that the strong correlation significantly to the company's productivity at 0.05 per cent level which included Flexible Manufacturing Cell (FMC). The further analysis exhibited in Fig. 6.19.

Table 6.39: Correlation Between Integrated Technology Training and Company's Productivity (Services Based)

Types of Integrated Technology Training		**(r)**
Flexibel manufacturing cell system (FMS)	Pearson Correlation	.178
	Sig. (1-tailed)	.103
Computer-integrated manufacturing (CIM)	Pearson Correlation	.178
	Sig. (1-tailed)	.103
Material requirement planning (MRP)	Pearson Correlation	**.233(*)**
	Sig. (1-tailed)	.048
Just-in-time (JIT)	Pearson Correlation	.105
	Sig. (1-tailed)	.230
Manufacturing	Pearson Correlation	.217
	Sig. (1-tailed)	.061
Manufacturing resources planning (MRP11)	Pearson Correlation	.213
	Sig. (1-tailed)	.065

* Correlation is significant at the 0.05 level (1-tailed).

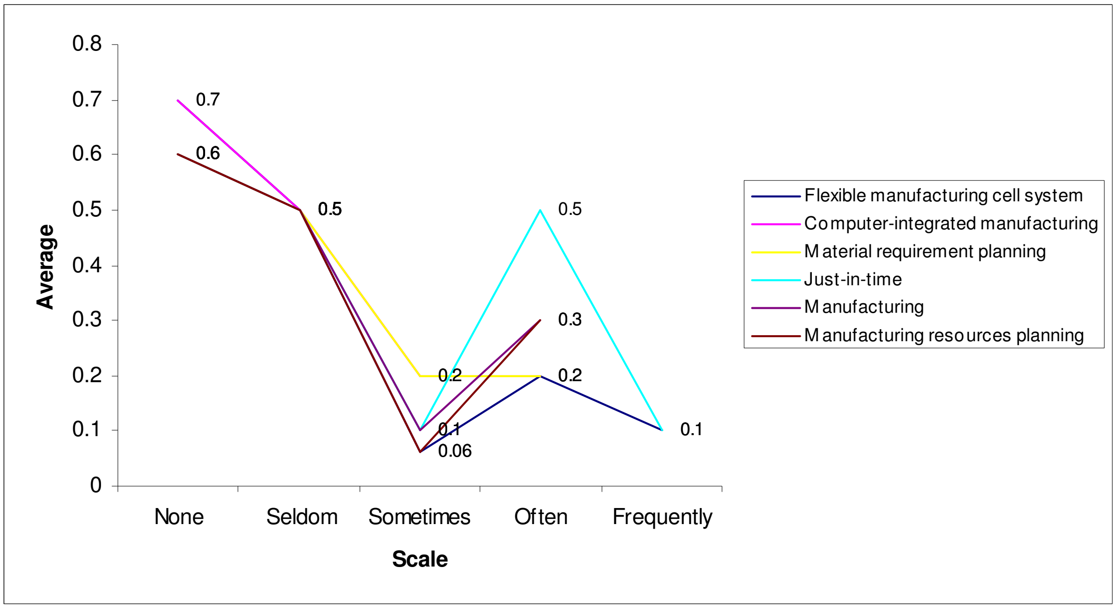

Figure 6.19: Graphical representation average scale of company's productivity based on Integrated Technology Training (Services Based)

c) Based on Both of Production and Services

This research also investigates company's productivity based on both production and services business. The results is exhibited in Table 6.39 show that Job based training have a significant correlation to the company's productivity at 0.05 per cent level.

Table 6.40: Correlation Between Administration Training and Company's Productivity (Production and Services Based)

Types of Administration Training		**(r)**
Information technology	Pearson Correlation	.488
	Sig. (1-tailed)	.110
Job base training	Pearson Correlation	**.681(*)**
	Sig. (1-tailed)	.031
Customer service/public relations	Pearson Correlation	.455
	Sig. (1-tailed)	.129
Marketing/publicity	Pearson Correlation	.211
	Sig. (1-tailed)	.308
Training/refresher courses	Pearson Correlation	.610
	Sig. (1-tailed)	.054
Management skills	Pearson Correlation	.437
	Sig. (1-tailed)	.139

* Correlation is significant at the 0.05 level (1-tailed).

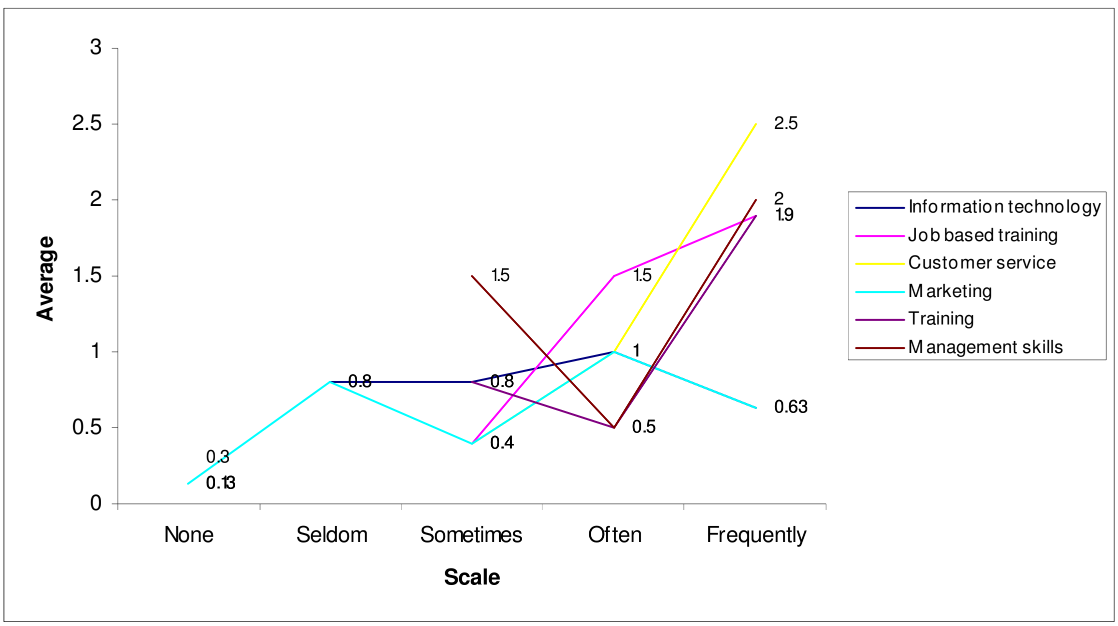

Figure 6.20: Graphical representation average scale of company's productivity based on Administration Training (Production and Services Based)

However, further analysis was carried out and depicted in Fig. 6.20. The highest average scale at 2.5 points and the important item corresponding to this is Job based training. This results in line with finding in Table 6.40 and with "*Frequently"* scale. To describe the effect of company productivity based on both production and services after the operation training is depicted in Table 6.41. The results indicate that operation training includes material control, production operation, project management, distribution, supplies, credit control, engineering, fixed asset management training and inventory control has correlation to the company's productivity significantly at 0.01 per cent level. Therefore, the other operation training such as Product development, HR recruitment, customer services, marketing and forecasting also show significant contribution to the company's productivity at 0.05 per cent level. This implies that most of the operation training to the company's is very important and contribute to productivity.

Table 6.41: Correlation Between Operation Training and Company's Productivity (Production and Services Based)

Types of Operation Training		**(r)**
Material control	Pearson Correlation	.817(**)
	Sig. (1-tailed)	.007
Scheduling	Pearson Correlation	.898(**)
	Sig. (1-tailed)	.001
Selling	Pearson Correlation	.889(**)
	Sig. (1-tailed)	.002
Product development	Pearson Correlation	.662(*)
	Sig. (1-tailed)	.037
Production operation	Pearson Correlation	.909(**)
	Sig. (1-tailed)	.001
Human resource recruitment	Pearson Correlation	.729(*)
	Sig. (1-tailed)	.020
Project management	Pearson Correlation	.791(**)
	Sig. (1-tailed)	.010
Distribution	Pearson Correlation	.882(**)
	Sig. (1-tailed)	.002
Supplies	Pearson Correlation	.870(**)
	Sig. (1-tailed)	.002
Invoice/billing	Pearson Correlation	.776(*)
	Sig. (1-tailed)	.012
Marketing/advertising	Pearson Correlation	.386
	Sig. (1-tailed)	.173
Credit control	Pearson Correlation	.622(*)
	Sig. (1-tailed)	.050
Customer service	Pearson Correlation	.771(*)
	Sig. (1-tailed)	.013
Engineering	Pearson Correlation	.810(**)
	Sig. (1-tailed)	.007
Fixed asset management	Pearson Correlation	.583
	Sig. (1-tailed)	.065
Inventory control	Pearson Correlation	.905(**)
	Sig. (1-tailed)	.001
Forecasting	Pearson Correlation	.779(*)
	Sig. (1-tailed)	.011

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

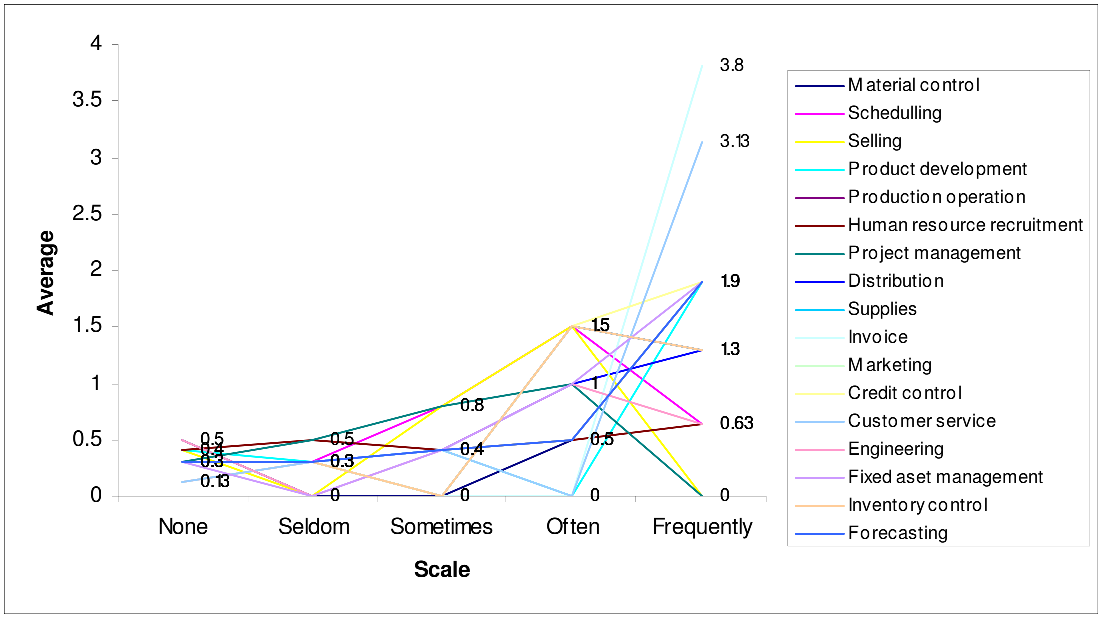

Figure 6.21: Graphical representation average scale of company's productivity based on Operation Training (Production and Services Based)

The impact of company's productivity (production and services) based on stand alone technology training was carried out with correlation analysis and depicted in Table 6.42. The results indicate that Computer aided design (CAD) and CNC have a significant correlation to the company's productivity at 0.01 per cent level. The CAPP and pick and place robots have a significant correlation at 0.05 per cent level. The further analysis exhibited in Fig. 6.22.

Table 6.42: Correlation Between Stand-Alone Technology Training and Company's Productivity (Production and Services Based)

Types of Stand Alone Technology Training		**(r)**
Computer-aided design (CAD)	Pearson Correlation	.806(**)
	Sig. (1-tailed)	.008
Computer-aided process planning (CAPP)	Pearson Correlation	.769(*)
	Sig. (1-tailed)	.013
Numerical control/computer numerical control NC/CNC/digital numerical control	Pearson Correlation	.825(**)
	Sig. (1-tailed)	.006
Pick-and-place robots	Pearson Correlation	.687(*)
	Sig. (1-tailed)	.030
Others robots	Pearson Correlation	.615
	Sig. (1-tailed)	.052
Material working laser	Pearson Correlation	.445
	Sig. (1-tailed)	.135

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

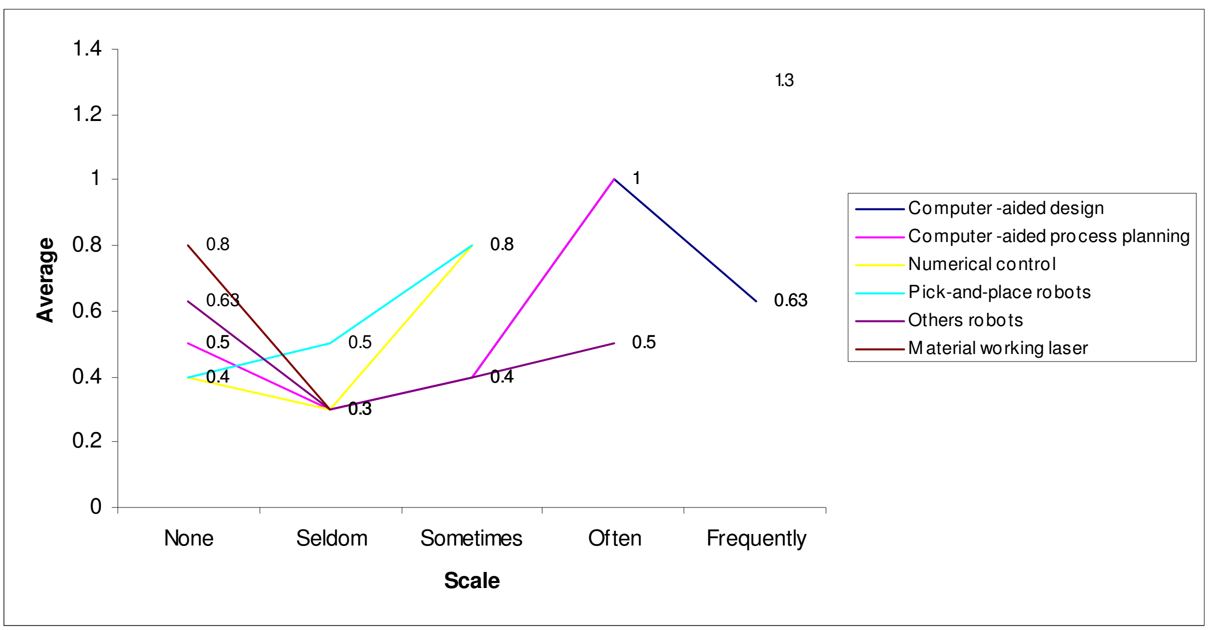

Figure 6.22: Graphical representation average scale of company's productivity based on Stand Alone Technology Training (Production and Services Based)

The effect of company's productivity based on intermediate technology training was carried out with correlation analysis and depicted in Table 6.43. The results indicate that Automatic storage and Retrieval system (AS/RS) and Fully automated inspection and testing equipment have a significant correlation to the company's productivity at 0.05 per cent level.

Table 6.43: Correlation Between Intermediate Technology Training and Company's Productivity (Production and Services Based)

Types of Intermediate Technology Training		**(r)**
Automatic storage and retrievel system (AS/RS)	Pearson Correlation	.775(*)
	Sig. (1-tailed)	.012
Automated material handling system (AMHS)	Pearson Correlation	.775(*)
	Sig. (1-tailed)	.012
Fully automated inspection and testing equipment	Pearson Correlation	.859(**)
	Sig. (1-tailed)	.003

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

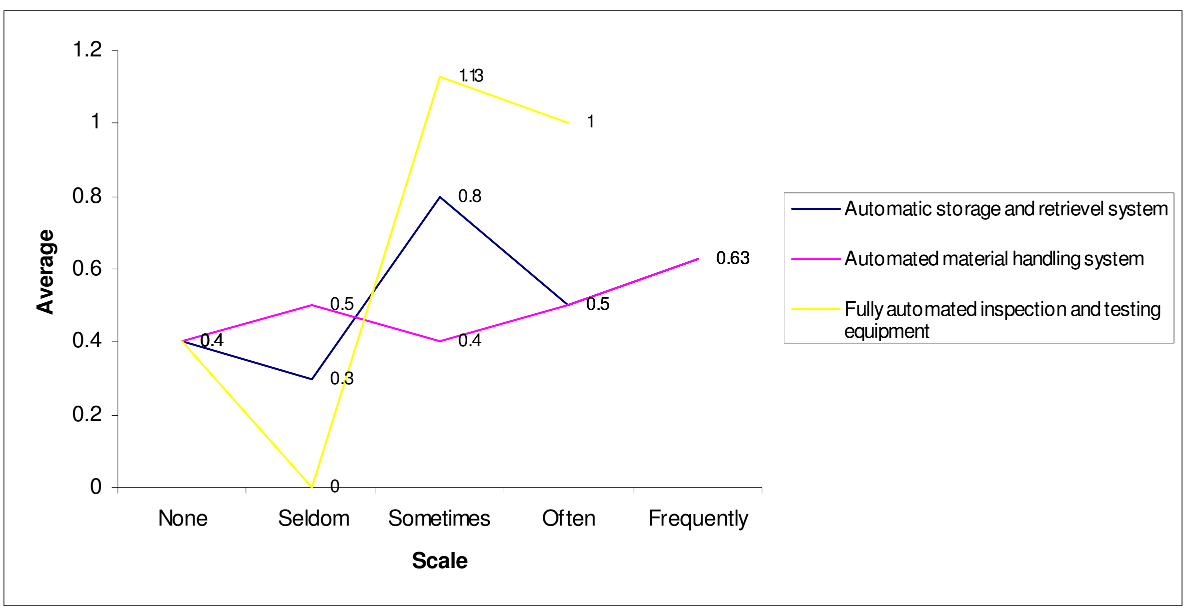

Figure 6.23: Graphical representation average scale of company's productivity based on Intermediate Technology Training (Production and Services Based)

In terms of the impact of company's productivity (production and services based) based on integrated technology training was carried out with correlation analysis and portray in Table 6.44. The results indicate that the strong correlation significantly to the company's productivity at 0.05 per cent level which included Flexible Manufacturing Cell (FMC), Computer Integrated Manufacturing (CIM), and Material Requirement Planning (MRP1). Thus, JIT , Manufacturing, and MRP11 have a significant correlation at 0.01 per cent level. The further analysis exhibited in Fig. 6.24.

Table 6.44: Correlation Between Integrated Technology Training and Company's Productivity (Production and Services Based)

Types of Integrated Technology Training		**(r)**
Flexibel manufacturing cell system (FMS)	Pearson Correlation	.744(*)
	Sig. (1-tailed)	.017
Computer-integrated manufacturing (CIM)	Pearson Correlation	.637(*)
	Sig. (1-tailed)	.045
Material requirement planning (MRP)	Pearson Correlation	.756(*)
	Sig. (1-tailed)	.015
Just-in-time (JIT)	Pearson Correlation	.845(**)
	Sig. (1-tailed)	.004
Manufacturing	Pearson Correlation	.829(**)
	Sig. (1-tailed)	.005
Manufacturing resources planning (MRP11)	Pearson Correlation	.832(**)
	Sig. (1-tailed)	.005

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

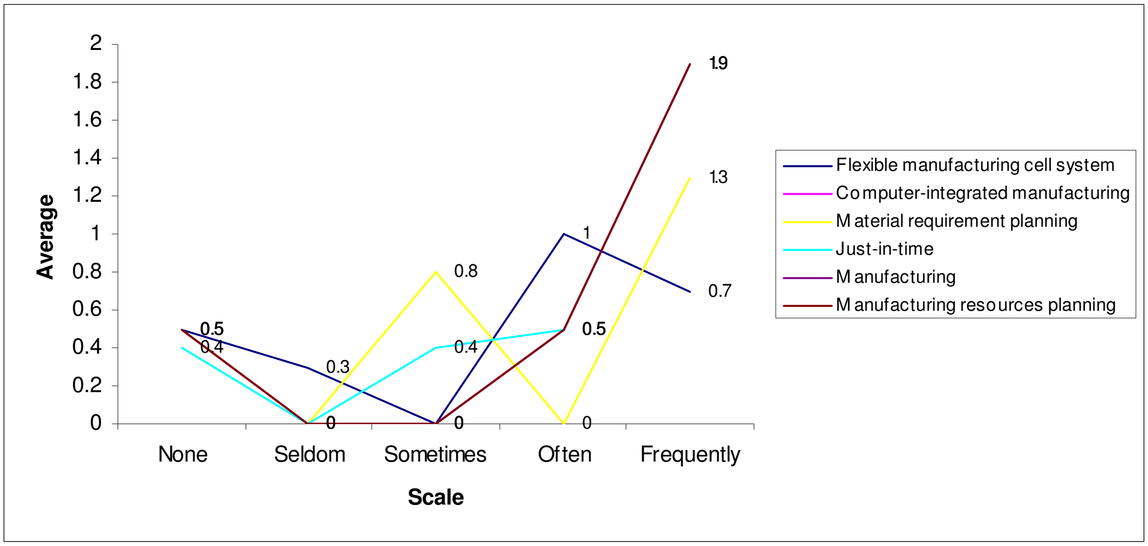

Figure 6.24: Graphical representation average scale of company's productivity based on Integrated Technology Training (Production and Services Based)

6.10 Summary

In general, the findings of the study indicate that the technology and ICT adoption, and training programs very relevant measurement in terms of impact to the company's productivity. From the inferential analysis that suggest that SMEs adopted technology and ICT more viable for the current business environment. In facts today, one of the critical effects of ICT and Technology adoption on organizational behavior concern the way people performs their tasks and works with each other.

CHAPTER SEVEN

CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

7.1 Introduction

The success of business in the new economy and in an increasingly competitive marketplace depends critically on the quality of management, which those organizations apply to their key business processes (Macintosh, 1999). With related knowledge, it will allow the organizations to exploit the opportunities in the market and gaining competitive advantage. For example, the supply chain in once manufacturing depends on knowledge diverse areas including raw material, planning, manufacturing and distribution. The supply chain management is one of the most important, strategic aspects of operations which encompassed so many related functions. It will help the organizations to make decision whom to buy the materials from, where to locate facilities, how to transport good and services, and how to distribute them in the most cost-effective, timely manner constitutes much of an organization's strategic planning. This chapter highlights selected key findings to support the research objectives and conclusion as well. Thus, this chapter also suggests that SME ICT policy as an important role to support society technology and ICT adoption awareness, particularly SMEs sector to support the growth continuously and improve productivity.

7.2 Selected Key Findings: Summary

A. Level of Technology and ICT Adoption in the Industrial Sector

1. On technology adoption, intermediate technology appears to be dominant in the fully and semi automated categories. This may suggest that solutions for technology adoption are currently most popular in the intermediate technology which could be more economical than integrated technology but have the power and capability that goes beyond stand-alone technology.

2. For future planning, the trend indicates a *shift* to the integrated technology. This may suggests that the direction the industry should take towards integrated technology as integrated solutions become more and more feasible and economical as organizations enter the era of globalization and become more competitive.

3. As organizations embark on IT adoption, the requirements for ICT training become more and more important. Respondents were asked on the frequency of ICT training for their staff in the administration and operations. The result shows that administrative staff undergoes more frequent ICT training than their operations counterpart. This is somewhat surprising as operations personnel should be equipped with the necessary ICT skills and knowledge for them to be able to become effective and efficient end-users responsible for the day-to-day operations of the business.

B. The level of Demand and Supply Skilled Worker Based on Technology and ICT to Fulfill Industrial Sector.

1. More than half of the sample indicated having skilled workers in both technology and ICT with both categories have about the same proportion. Though this may look encouraging, quite a significant proportion (46 per cent) of respondents indicated they did not have adequate skilled workers in both technology and ICT.

2. A closer look at the distribution of skilled workers shows that for the technology industry, slightly above ***30 per cent*** have 10 or less skilled workers.

3. This study suggest that the respondents believe that there will not be any increase in the demand for workforce in the next (5) years in companies with 25 or less employees across all management levels.

4. Findings suggest that for bigger sized companies, the trend appears to be the opposite, where there seems to be an increase in management workforce demand for the next (5) years across all (3) management levels with the operations level showing the highest increase. This may indicate larger companies are expected to have more job openings for all management categories particularly at the operations level in the technology and ICT industry in Malaysia within the next (5) years.

5. Larger companies tend to have increased demand for skilled, semi-skilled and unskilled workers in the next (5) years. This may again suggest that while smaller companies tend to have less demand for technology workforce in the future, larger companies on the other hand tend to have more demand for technology workforce within the next (5) years. This is particularly true in the semi-skilled category where the demand appears to be the greatest.

6. The findings also indicate that the current demand for ICT workforce is in the ICT support category, followed by the database administrator, systems analyst or application developer category and desktop publishing, is that order.

7. Almost 60 per cent of the sample employs non-ICT officers as knowledge workers, which can be considered as a significant development in Malaysian towards becoming a knowledge society.

8. The findings also suggests that the direction the industry should take towards integrated technology as integrated solutions become more and more feasible and economical as organizations enter the era of globalization and become more competitive.

9. Competent and skilled technology user come with adequate training to join the workforce and firms must be prepared to allocate appropriate training budget for these knowledge workers.

10. The results also indicate that service based companies have better productivity performance than production based companies. This may suggest that more focus should be given to the service industry in order to help accelerate the Malaysian economy, particularly in its efforts to become a fully developed nation.

11. In the technology category, companies with larger employees tend to have adequate skilled workers, but smaller technology companies tend not to have enough skilled workers. Similarly for ICT category, larger ICT companies tend to have enough skilled workers, but smaller ICT companies tend not to have enough skilled workers.

C. The Impact of Technology and ICT Training to the Company's Productivity

1. In general, the findings of the study indicate that technology and ICT adoption as well as training programs are very relevant measures company's productivity.

2. The inferential analysis suggests that SMEs which adopted technology and ICT were more productive than those which did not.

3. One of the critical effects of ICT and Technology adoption on organizational behavior concerns the way people perform their tasks and work with each other. Companies that adopted technology and ICT had workers who were use skilful than those that did not.

4. This study suggests that SMEs need to deliver in all sense of the word, “around the clock” and need to continuously innovate with new ideas and products. Flexibility, quality, and customer services orientation thus, become essential.

7.3 Implication and Recommendations

Knowledge management has existed for many years, but only within the past few years it has gained noteworthy attention (Audrey and Robert, 2001). Many of the organizations pursuing knowledge management strategy, because they believe that knowledge management is the central to their ability to grow and compete (APQC, 1999). It has been suggested that in order to survive and be innovative, companies are nowadays not only dependent on the knowledge they have but on the ability to generate new strategically valuable knowledge. So the organizations must be able to use their knowledge resources to produce goods and services in order to increase their products in a higher value. Capabilities and sustainable competitive advantage of one organization come from continuously developing existing resources and capabilities and creating new resources and able response to the market change. The small and medium enterprises (SMEs) play an important role in providing linkages to export-oriented industries in Malaysian economy. The SMEs are expected to contribute significantly in terms of value added and labor absorption in economic growth, particularly in the manufacturing sector, as driver of growth It is estimated that there are 18270 (SMIDEC 2004) SMEs of which 76% are small enterprises and 24% are medium enterprises. A such the numbers of small and medium industries are expected to be around 20,000 and is said to dominate the manufacturing sector in Malaysia

Although the numbers of new small business entrants and participations seem to increase, problems and constraints faced by the small businesses , particularly in getting business financing and loans from the commercial banks are not deniable. Issues on small business problems relating to lack of capital and financing difficulties, lack of sales and marketing mechanisms, low technology used, skill workers, production capacity, low quality of products and services, inadequate supply of material, competition are often raised by the entrepreneurs and usually discussed and debated among the entrepreneurs, the government and private sector representatives . In the study of successful entrepreneurs, it was found that there are numerous factors, both internal and external, that contribute to the development and the economic success of the business. All in all, the success of any business understandings is significantly due to the traits, skill, the entrepreneurial values and behavior of the individual entrepreneurs and the significant roles of the government in promoting and providing the business infrastructure and info-structure.

Malaysia is preparing to be part of the information age society in the new millennium by transforming itself into a knowledge-based economy. In this context, information technology and multimedia form a unique enabling tool to support the growth of economy and to enhance the development of SMEs. The country anticipates a rapid acceleration of ICT application in all economic sectors, with a significant impact on the recruitment of ICT and related personnel. Therefore, the policy focus of the

Malaysian human resource development is to develop ICT culture in Malaysia society. The education and training delivery system will be expanded not only to produce highly qualified and technically competent workforce, but also to provide training and retraining opportunities to the SME entrepreneurs. This would enable ICT-literacy in the SMEs sector and help in meeting the vision of Malaysia becoming an ICT-based and knowledge based entrepreneur. ICT is critical in enhancing SMEs in competitiveness in the global market. Both private and public sectors have undertaken investments and developments in computer hardware and software, as well as in other infrastructures including telecommunications network, to facilitate the use of ICT in producing goods and providing services. Globalization and borderless Information Communication Technologies (ICT) are forcing businesses to change the ways things are being done in order to stay competitive and survive. It has been widely recognized that a knowledge-based economy (K-Economy) is the way forward in the constantly changing world economy. Malaysia, therefore, needs to transform to become a nation that positions itself high on the learning curve, receptive to new technologies and apply the knowledge acquired for economic growth.

The transformation into a knowledge-based economy requires the optimal use of ICT in business. Currently, over 90% of the manufacturing establishments in Malaysia are SMEs companies. However, only 16% of the SMEs has an e-commerce strategy, 7% has internet order taking and 2% has internet order payment. 80% of the SMEs cater to domestic market only. It has been suggested that SMEs, need to take advantages of export market. However most SMEs are not yet doing so. Why are SMEs not taking advantage of export market? Could this be a sign of complacency or the inability to compete internationally? With the onslaught of globalization and dynamic market place, SMEs must respond quickly to new developments and concepts. The new K-economy will lead to increased productivity, higher income as well as a better quality of life. Business survival, therefore, in a borderless global economy based on knowledge requires new skills and assimilate the culture of advanced technology and dynamic entrepreneurship.

Issues on small business problems are related to financing, marketing, technology used, availability of skilled workers, production capacity, quality management , inadequate supply of input materials and stiff competition are often raised by the entrepreneurs to the government. These problems and obstacles often found are listed below:

- High production cost due to production and low quality product
- Low technology
- Lack of or no inter and intra industry linkages to support the companies development
- Poor management and non aggressive marketing
- SMI focusing on certain areas in the manufacturing sector which worsen the competition
- Inadequate financial assistance from the government and the terms and conditions of loans are too tight. There is no flexibility for SMI
- The criteria which have been fixed for the eligibility of incentives for SMSI should be altered in order to enable more SMI to enjoy the incentives provided by the government

- Infrastructures and lands to build a factory is insufficient for SMI companies to develop their industry and business fundamentals unorganized SMI development programs.

Following, various government strategies are formulated and actions are taken to address these problems at national level. Subsequently, entrepreneurship education and training, availability of numerous loans, marketing of products, business consultation, awards of government tenders, allocation of business premises and various entrepreneurial development programs are conducted and provided by 20 ministries and 30 government agencies (Table 7.1 and Table 7.2). Table 7.3 list the credit schemes for the SMEs in Malaysia.

Table 7.1:

List of Government Agencies Participated in Entrepreneurship Development Programs

Technical and vocational training
Marketing of product and services
Business loan and credit facilities
Entrepreneurship & Business Education
Counseling and Consultancy
Location: Business premises and location
Venture Capital
Government Contracts
Franchising

Table 7.2

List of Ministries and Government Agencies participated in SME development in Malaysia

1. Prime Minister department - Economic Planning Unit,
2. Ministry of Finance
3. Ministry of International Trade and Industry
4. Ministry if Entrepreneurial Development
5. Ministry of National and Rural Development
6. Ministry of Land and Cooperative Development
7. Ministry f Human Resource Development
8. Ministry of Youth and Sports
9. Ministry of Education
10. Ministry of Science, technology and Environment
11. Ministry of Public Works
12. Ministry of Culture, Arts and Tourism
13. Ministry of Agriculture
14. Ministry of Prime Industries
15. Ministry of Domestic Trade and Consumer affairs
16. Ministry of National Unity and Community affairs
17. Ministry of Housing and local council
18. Ministry of Energy, Telecommunication and Multimedia
19. Associations
20. State Governments – State Economic Development Corporations

Table 7.3:

Lists of Credit Schemes

No.	Entrepreneur Fund	Agency
1.	Economic Fund for Entrepreneur Group (TEKUN)	TEKUN National foundation(YTN)
2.	MARA Financing Schemes a) General Financing Schemes b) Entrepreneurial Existing Financing Schemes c) Professional Financing Schemes d) Transportation Financing Schemes	Majlis Amanah Rakyat (MARA) Ministry of Entrepreneurship

	e) Mini Market Financing Schemes f) Small Financing Schemes g) Technopreneur Financing Schemes h) Contract Financing Schemes i) Fix Accommodation Contract Financing Schemes j) Special Manufacturing and Franchise Financing Schemes	Development (KPuN)
3.	Small Entrepreneur Guarantee Schemes (SEGS)	Credit Guarantee Corporation Malaysia Limited (CGC)
4.	Graduate Entrepreneurship Fund	Development & Infrastructure Bank of Malaysia (BPIMB)
5.	State Centre Financing Schemes	National Corporation Ltd (PNS) & State Economic Development.
6.	Basic Capital Schemes	BPIMB
7.	PNS Financing Schemes	PNS
8.	Credit Schemes (Special)	BPIMB
9.	Venture Capital for Hi-Tech Technology	BPIMB
10.	Cooperative Support Schemes	RHB Bank Limited (Consortium 18 of Commercial Bank)
11.	Franchise Development Support Schemes	Department of Franchise & Vendor, KPuN
12.	Franchise Financing Schemes	CGC
13.	New Principal Guarantee Schemes (NPGS)	CGC
14.	Islamic Banking Schemes	CGC
15.	Flexi Guarantee Schemes	CGC
16.	'Integrated' Credit Schemes	CGC
17.	Direct Access Guarantee Schemes	CGC
18.	Youth Economic Development Program (YEDP)	CGC
19.	Film Fund	BPIMB
20.	Film Producer Fund	BPIMB

21.	MPPB Financing Schemes	Agriculture Bank Malaysia Ltd (BPM)
22.	Mechanic & Agriculture Automation Financing Schemes	BPM
23.	R & D Commercialization Fund	Malaysian Technology Development Corporation (MTDC)
24.	Technology Acquisition Fund (TAF)	MTDC
25.	Modernization & SMEs Automation financing Schemes	Small Medium Industries Development Centre (SMIDEC)
26.	Quality Upgrade For SMEs Financing Schemes (SPM)	BPIMB
27.	Technical Support Fund [ITAF 1 – 4]	SMIDEC
28.	Financial Package for SMEs (PAKSI)	BPIMB
29.	Women Special Support Schemes	SMIDEC, BITMB & MTDC
30.	Industrial Grant Schemes for R& D (IGS)	Secretariat IGS, Ministry of Science, Technology & Environment
Multimedia Development Corporation (Pte) Ltd (MDC)	Research and Development MSC Schemes	
32.	Application Tutor Grant Schemes	MIMOS Ltd.
33.	Machines & Goods for Industrial Program in Rural Development *1 January 2001 – This schemes namely as (Rural Economic Financing Schemes (REFS).*	BPIMB & Bank Islam Malaysia
34.	Amanah Ikhtiar Malaysia Schemes	Amanah Ikhtiar Malaysia (AIM)
35.	'Single Parent' for Women Financing Schemes	AIM
36.	'Ikhtar Fishery' Financing Schemes	AIM

37.	PUNB Schemes	National Entrepreneurship Corporation Ltd. (PUNB).
38.	New Entrepreneur Fund	Selected Financial Institution.
39.	Food Fund	All Financial Institution.
40.	SMEs refreshener Fund	All Financial Institution.
41.	Shipping Fund	BPIMB
42.	SMEs / SMIs 2 Fund	All Financial Institution.
43.	Bumiputera Entrepreneurship Project Fund	ERF S (Pte) Limited. *(BNM -- Central bank subsidiaries)*

SMEs face barriers to growth from poor or inadequate information due to wider market environment (pricing, demand, trends) and with poor communications between suppliers and markets (Barton & Bear 1999). The greatest constraints to businesses generally, whether ICTs were in use or not, are; access to capital for equipment or raw material; a shortage of adequately skilled personnel and; a lack of business management expertise or business model (Barton & Bear 1999). Lack of financial capital to provide the security necessary for innovation is also a common impediment to growth. Barton & Bear (1999), suggests that strengthening local capacities is crucial for enabling SMEs to carry out necessary administration and business forecasting and to be able act upon the new information delivered over ICTs.

In Malaysia, SMEs demand for basic telecommunication services (the telephone and fax) is growing but awareness of, and demand for, higher and services such as email and Internet are low (Razli and Juhary; 2001). In many countries the prohibitively high cost of internet subscriptions, long distance calls and the paucity of relevant business content, mean in the short term, the benefits of information delivery systems and networks will not be exploited by SMEs. Mostly, in Asian region for seven Asian countries have national ICT strategies but four countries such as Laos, Burma, Cambodia and Brunei are not available yet (see Table 21). This national ICT strategy is very crucial to enhance SMEs growth and clear direction. Generally, all Asian countries have ICT strategies such as promotion to ICT content and human capacity building in order to create knowledge society and ICT environment (see Table 22). To ensure that SMEs, are performed into the prevailing of the knowledge based economy, the government in Asian countries will formulate programs and IT strategies to accelerate the creation of a critical mass of capable, progressive and efficient SMEs.

IT is critical in enhancing Malaysia's competitiveness in the global market. Both private and public sectors have undertaken investment and development in computer hardware and software, as well as in other infrastructures including telecommunications and network, to facilitate the use of IT in producing goods and providing services. Investment in IT in Malaysia expanded at the rate of 8.4 per cent per annum during 1996-98, increased from M$3.8 billion in 1995 to M$4.84 billion in 1998. The increase was attributed, in part, to a number of fiscal incentives introduced to promote the use of IT, such as the removal of sales tax on computers and components and granting of accelerated capital allowance for expenses on computers and other equipment. There is also an increasing awareness on the use of IT for home and personal use. This increased application and information diffusion have resulted in a significant increase in the demand for highly qualified, technically skilled and competent IT and related workforce in the industries. Thus, Malaysia has a good potential background for ICT development and still moving forward to increased ICT awareness in the society (see Table 7.4).

Table 7.4
Some basic economic and ICT indicator for Malaysia, 2002
(Source: Economic Report 2001/2002 and MECM)

Malaysia: Country Profile	
❑ Area	: 330 sq km
❑ Population	: 23 million
❑ GDP	: US 80 Billion
❑ Per Capita	: US 3,500
❑ Labor Force	: 9 million
❑ Trade	: 17th Largest
❑ Tel Penetration	
o Fixed Lines	: 22/100 pop.
o Mobile	: 30/100 pop.
❑ Internet	: 10/100 pop.
❑ Internet Users	: 5.5 million
❑ PC	: 108/1000 pop.
❑ Internet Hosts	: 4/1000 pop.

One of the 8th Malaysia Plan ICT policy thrusts is nurturing a critical mass of ICT-based SMEs (See Table 25). The creation of ICT-based SMEs is important for the development of a knowledge-based economy. For this initiative, the government will establish an ICT fund to provide financial support, especially to SMEs and ICT start-up companies. Specific guidelines will be drawn up, which include flexible lending requirements to provide SMEs greater access to the fund. To facilitate greater disbursement of the fund, training course on risk assessment will be conducted to build up the expertise of those managing the fund. Ministry of International Trade and Industry (MITI) launched e-commerce Grant Scheme for SMEs with allocation RM 20 million in 2002 (New Strait Time, 14 May 2002). This scheme is an effort by government to encourage SMEs to use ICT in their business applications. Other initiatives grant scheme by government such as e-manufacturing, the RosettaNet Linkage grant and Engineering Design Grant to enhance the adoption of ICT by the SMEs.

Table 7.5

8th Malaysia Plan ICT Policy Thrusts

8th Malaysia Plan ICT Policy Thrusts
❑ Positioning Malaysia as major global ICT and Multimedia hub ❑ Upgrading and Expanding the communications infrastructure ❑ Enhancing human resource development in ICT ❑ Promoting e-commerce and enhancing its use ❑ Fostering local capabilities in creative content development ❑ Rolling out the MSC flagship applications ❑ *Nurturing a critical mass of ICT-based small and medium sized enterprises* ❑ Promoting R & D activities on soft factors

(Source: 8th Malaysia Report)

An internet survey conducted by IDC recently reported that Malaysia's internet population is expected to grow at an average rate of 20% per annum over the next 5 years to 6 million by 2005 from 2.5 million in 2000. Malaysia also has quite growth dramatically in the number of Internet users from 30 thousand people in 1995 to 6.5 million people in 2001(see Table 7.6).

Table 7.6:

Estimated Statistics for PCs and Internet in Malaysia

	1995	1996	1997	1998	1999	2000	2001
PC's - Active Installed (Units)	610K	760K	1.03M	1.36M	1.8M	2.2M	3.0M
Number of Internet Subcribers	18K	90K	200K	400K	700K	1.4M	2.0M
Number of Internet Users	30K	180K	500K	1.5M	2.8M	4.0M	6.5M

Source: http://www.pikom.org.my/

7.4 Proposal for National ICT Policy and Regulatory Framework for SMEs in Malaysia

There are two types of national ICT policies. Firstly, dedicated infrastructure development of generic types (*supply side*) is necessary to enable ICT usage. Secondly, there are policies that induce the use and adoption of ICT both in household, firms (particularly SMEs) and the public sector itself (*demand side*). For instance, government adoption and use of different types of ICT are important ways of supporting the development of ICT infrastructure, to stimulate demand and provide incentives to SMEs sector. From our analysis, we identify and propose six SMEs ICT policies in order to facilitate the national ICT agenda. There are 1) Human resource, awareness, education and training; 2) Infrastructure; 3) Research & Development; 4) Cluster & Network (includes B2B Promotion, Business information services, ICT support programs); 5) Regulation & E-government (includes Standards and Tax Policies); 6) Fiscal & Financial Incentives (Financing-ICT Fund) (see Fig. 7.2).

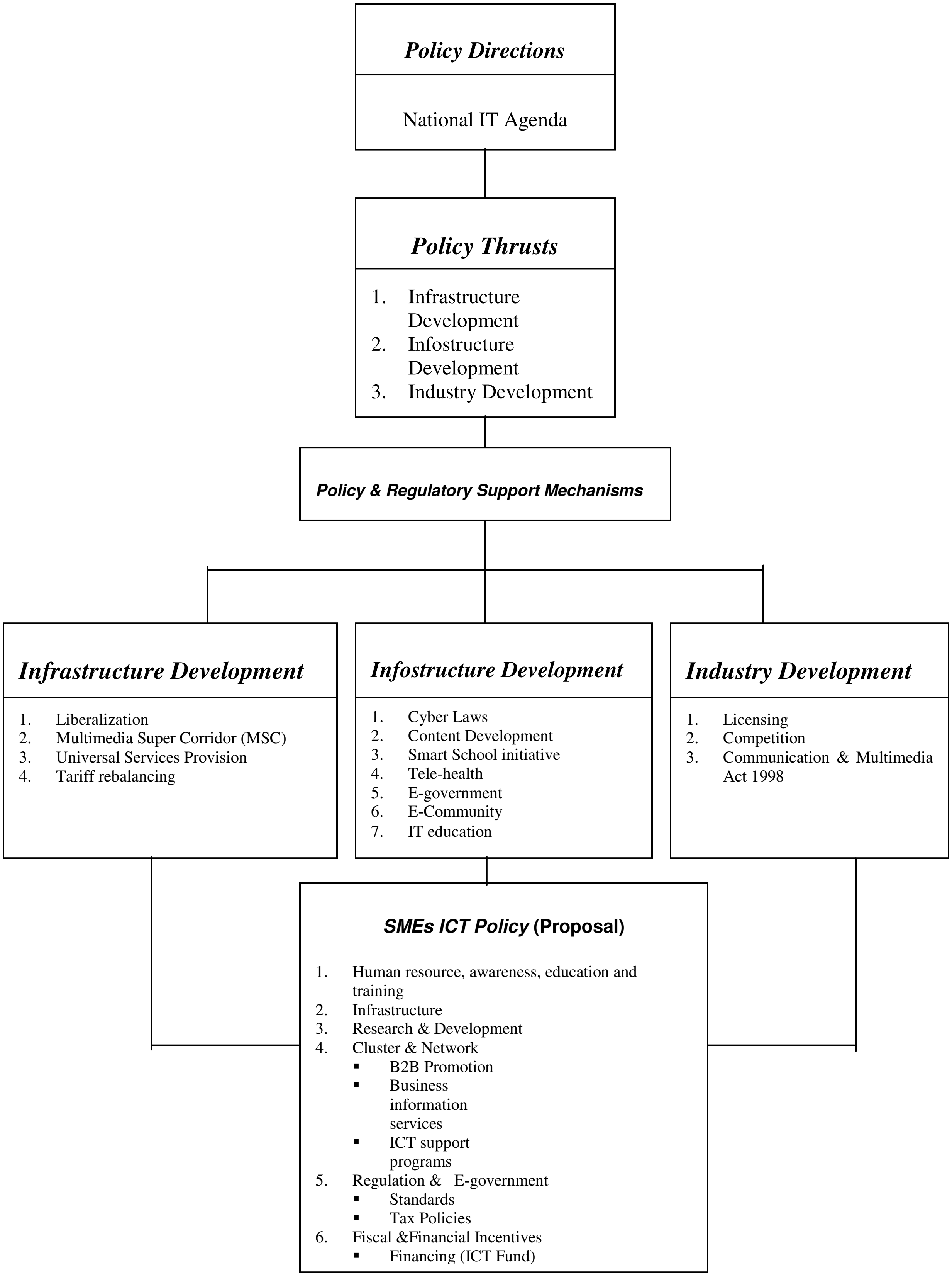

Figure 7.1: Proposal for National ICT Policy and Regulatory Framework for SMEs in Malaysia

7.5 SMEs ICT Policy Support System Framework

In Malaysia, SMEs and ICT policy have two different parts in policy-making process. Hence, they have several programs, which are overlapped between SMEs and ICT policy. Both elements involved in policy support systems are SMEs policy and ICT/E-commerce/S & T policy, where they have separate support mechanism such as SMEs support mechanism and ICT support mechanism. Ministry or agency involves in both policies should play dual effective role. They must provide policy advice and exercise direct administrative responsibility in SMEs ICT policy. The proposed SMEs ICT policy support system framework is to enhance innovative NITC model towards adoption a high-tech strategy to arrive at the cutting edge of social, economic and technological development, and create '*demand pull*' as well as '*supply push*' environment for the faster adoption for SMEs. The SMEs ICT policy support system framework is shown in Figure 7.3. Thus, the mapping of ICT policies and several initiative programs under SMEs ICT policies are shown in Table 7.7.

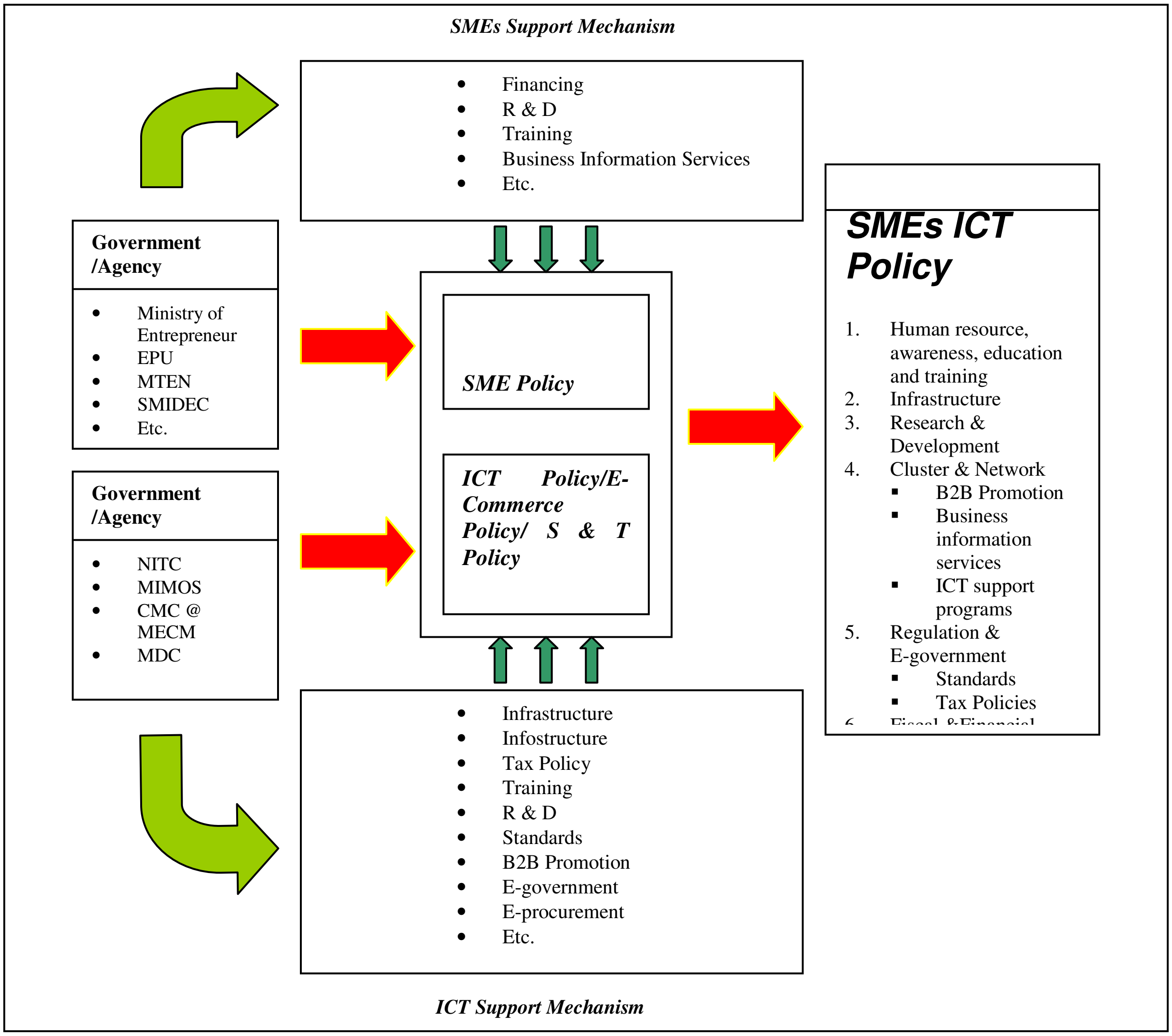

Figure 7.2:

SMEs ICT Policy Support System: Conceptual Framework

Table 7.7:
Malaysia: Mapping ICT Policies for SMEs in the Knowledge Economy

Access to digital Infrastructure & Technologies	Human Resource, awareness, education, training on ICT	ICT Infrastructure	Research & Development	Cluster & Networks	Regulation & e-government	Fiscal & Financial Incentives
	▪	▪ MSC-support SMEs to open new markets by providing electronic support ▪ Incubation Centre (Eg. Kulim Hi-Tech; Technology Park etc.) ▪	▪ Research and Development MSC Schemes ▪ SMIDEC e-commerce grant ▪ Bio-Valley Malaysia: - National Institute for Agro-Biotechnology - National Institute for Pharmaceutical and Neutraceutical Biotechnology - National Institute for Genomics and molecular biology	▪ Malaysia E-commerce Readiness Assessment (MECRA)- to creates ICT indicators ▪	▪ Market liberalization ▪ 1987 – Corporation and Privatization of Telecom Malaysia ▪ 1993 – Introduction of Competition in the Cellular Market ▪ 1995 – Approval of 5 TELCO Licenses ▪ 1998- Enactment of the Communications and Multimedia Act-convergence and competition 2001 approved-USP (Universal Services Provision)	▪ Universal Services Provision Fund (USPF)
Access to Network	▪ Increase public awareness of ICT ▪	▪ Support activities by private companies research establishments	▪ MIMOS ▪	▪	▪ 2000 – New Licenses Regime-vertical separation of communication licenses; application services; network service; network facilities; content application ▪ 2000 – Deregulation of mobile services sector market driven tariffs ▪ 2001 – Liberalization of last mile –new network facility for the last mile infrastructure ▪ Cyber laws ▪ Tele health	▪ RosettaNet Grant (applied supply chain management inter electric & electronic companies (SMIDEC) ▪ E-manufacturing Grant (SMIDEC) ▪ Technopreneur Financing Schemes(MARA) ▪ Venture Capital for Hi-Tech Technology (BPIMB) ▪ Technology Acquisition Fund (TAF) (MTDC)
Access to knowledge creation	▪ IT education ▪ Advanced Technology Centre (ADTECs)	▪	▪ ▪	▪ National Vocational Training Council (MLVK)	▪ e-learning ▪ e-community ▪ Smart school initiatives ▪	▪ Skills Development Fund (SDF)

7.6 Summary

Without innovative *SMEs ICT support policies*, many people in developing countries, especially the poor, will be left behind. In an era of increased globalization, many governments have begun to adopt the view that the protection and nurture of local SMEs firms are necessary for the maintenance of national identity. Nevertheless, to achieve the policy objective and direction, there are three types of specific policies should be measured such as raising awareness and ICT skills, promoting SMEs support network and helping SMEs to participate in e-marketplace. This has been manifested particularly for the era of ICT, which has been regarded as a *key driver* and *engine of economic growth* in the new economy.

This research has shown that there has been an excess of SMEs ICT policies for SMEs in Malaysia, which indirectly becomes a key aspect of government industrial policy. However, the role of ICT policy by government and SMEs sector in the new millennium, it should be measured, and most of all be as broad based and smoothed as possible.

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RESEARCH QUESTIONNAIRE

IRPA NO: 05-02-07-10014-EAR

HUMAN RESOURCE DEVELOPMENT (HRD) : TECHNOLOGY & ICT ADOPTION IN INDUSTRIAL SECTOR, MALAYSIA

SOAL SELIDIK UNTUK MAJIKAN

(Research Questionnaire for Employer)

BAHAGIAN A: LATAR BELAKANG DIRI DAN SYARIKAT

(PART A: BACKGROUND OF THE COMPANY AND YOUR INFORMATION)

ARAHAN

(INSTRUCTIONS)

Sila berikan maklumat di ruang yang disediakan atau gunakan tanda (√) di mana perlu.

(Kindly supply the information in the spaces provided or mark (√) in the appropriate box)

1. Di manakah lokasi organisasi tuan?
   (Where is your organization located?)

   Negeri *(State)* : ____
   Bandar *(Town)* : ____
   Alamat *(Address)* : ____
   ____

2. Status syarikat anda.
   (*Your company's status*)

   MSC ☐ Ya *(Yes)*

   ☐ Tidak *(No)*

3. Pemilikan syarikat tuan.
   (Ownership of your organization)

   ☐ Pemilikan rakyat Malaysia sepenuhnya
   (100% Malaysian owned)
   ☐ Pemilikan tempatan (51% atau lebih saham dipegang pemilik tempatan)
   (Malaysian-owned company, with 51% or more shares owned by Malaysian)
   ☐ Pemilik luar negara (51% atau lebih saham dipegang oleh pemilik luar negara)
   (Foreign-owned company, with 51% or more shares owned by foreigners)
   ☐ Kerajaan *(Government)*

4.a) Saiz tenaga kerja syarikat tuan.
(Size of the employees in your organization)
Jumlah:____________
(Total)

4.b) Aktiviti utama syarikat tuan
(Primary activity of your company)

____

____

_____

4. Saiz tenaga kerja syarikat tuan.
   (Size of the employees in your organization)

   Jumlah:___________
   (Total)

5. Jawatan anda (*Your position*)

   ☐ Pengurus operasi (*Operation manager*)

   ☐ Pengurus pengeluaran (*Production manager*)

   ☐ Pengurus bahagian (*Division manager)*

   ☐ Pengurus besar (*General manager*)

   ☐ Lain-lain (*Others)*
   Sila nyatakan (*Please specify*)
   ____

6. Adakah syarikat anda mempunyai pekerja berkemahiran teknologi yang mencukupi (selain daripada ICT ?)
   (Does your company have enough skilled workers in technology, apart from ICT ?)

   ☐ Ya *(Yes)*

   ☐ Tidak *(No)*

   Jika 'Ya' sila ke soalan no. 8.
   (*If yes, please go to number 8*)

7. Jika Tidak, sila nyatakan peratusan yang diperlukan.
   (If not, please state how many per cent is required)

   ☐ 10 % and below

   ☐ 11 % to 20 %

   ☐ 21 % to 30 %

   ☐ 31 % to 40 %

   ☐ 41 % to 50 %

   ☐ 51 % and above

8. Adakah syarikat anda mempunyai pekerja berkemahiran ICT yang mencukupi?
(Does your company have enough skilled workers in ICT?)

☐ Ya *(Yes)*

☐ Tidak *(No)*

Jika 'Ya" sila ke soalan no. 10.
(*If Yes, please go to number 10*)

9. Jika Tidak, sila nyatakan peratusan yang diperlukan.
(If not, please state how many per cent is required)

☐ 10 % and below

☐ 11 % to 20 %

☐ 21 % to 30 %

☐ 31 % to 40 %

☐ 41 % to 50 %

☐ 51 % and above

10. Anggaran bilangan gunatenaga di syarikat anda mengikut kategori:
(Approximate number of workforce in your company based on categories)

a) Pengurusan
(Management)

	2004 Bilangan *(Number)*	2005-2010 Bilangan *(Number)*
i. Pihak pengurusan atasan *(Top level management)*	________	________
ii. Pihak pengurusan pertengahan *(Middle level management)*	________	________
iii. Pengurusan operasi *(Operation management)*	________	________

b. Teknologi
(Technology)

	2004 Bilangan *(Number)*	2005-2010 Bilangan *(Number)*
i. Pekerja Mahir *(Skilled workers-fully automated)*	________	________
ii. Pekerja Separa Mahir *(Semi-skilled workers-semi automated)*	________	________
iii Pekerja Tidak Mahir *(Unskilled workers-fully manual)*	________	________

c. Teknologi Komunikasi dan Maklumat (ICT).
(Information and Communication Technology (ICT)

	2004 Bilangan *(Number)*	2005-2010 Bilangan *(Number)*
i. Jurutera Komputer *(Computer engineer)*	________	________
ii. Pakar Sokongan Komputer *(Computers support specialist)*	________	________
iii. Juruanalisis Sistem *(System analyst)*	________	________
iv. Pegawai Tadbir Pangkalan Data *(Database administrator)*	________	________
v. Pakar Dalam "Desktop Publishing" *(Desktop publishing specialist)*	________	________
vi. Pegawai yang bukan latarbelakang ICT tetapi menggunakan komputer dalam operasi harian. *(Non- ICT officer who uses computer in daily operations)*	________	________

11. Sila nyatakan bilangan tahun syarikat beroperasi.
(Please state the number year your company operation)

_________ tahun *(year)*

BAHAGIAN B: PENGGUNAAN TEKNOLOGI KOMUNIKASI DAN MAKLUMAT (ICT)

(PART B: INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ADOPTION)

1. Sila tandakan (√) tahap automasi yang bersesuaian bagi setiap item yang disenaraikan.
   (Please mark (√) the appropriate level of automation for each of the items listed)

a. PENTADBIRAN

(Administration)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	Pembelian *(Purchasing)*	☐	☐	☐	☐	☐
2	Membuat Kerja Tender *(Tender)*	☐	☐	☐	☐	☐
3	Kos dan Perbelanjaan *(Cost and Expenses)*	☐	☐	☐	☐	☐
4	Penyimpan Kira-kira *(Bookeeping)*	☐	☐	☐	☐	☐
5	Pengurusan Sumber Manusia *(Humanr Resource Management)*	☐	☐	☐	☐	☐

b. OPERASI

(Operations)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	Kawalan Bahan *(Material control)*	☐	☐	☐	☐	☐
2	Penjadualan Perancangan *(Scheduling)*	☐	☐	☐	☐	☐
3	Penjualan *(Selling)*	☐	☐	☐	☐	☐
4	Pembangunan Produk *(Product Development)*	☐	☐	☐	☐	☐
5	Operasi Pengeluaran *(Production Operation)*	☐	☐	☐	☐	☐

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan (*In-Planning*)	Tidak Berkaitan (*Not Applicable)*
6	Pengambilan Sumber Manusia *(Human Resource Recruitment)*	☐	☐	☐	☐	☐
7	Pengurusan projek *(Project management*)	☐	☐	☐	☐	☐
8	Pengedaran *(Distribution)*	☐	☐	☐	☐	☐
9	Pembekalan *(Supplies)*	☐	☐	☐	☐	☐
10	Invois/Bil (*Invoice/Billing)*	☐	☐	☐	☐	☐
11	Pemasaran/ Pengiklanan (*Marketing/Advertising)*	☐	☐	☐	☐	☐
12	Kawalan Kredit (*Credit Control*)	☐	☐	☐	☐	☐
13	Perkhidmatan Pelanggan (*Customer Service)*	☐	☐	☐	☐	☐
14	Kejuruteraan *(Engineering)*	☐	☐	☐	☐	☐
15	Pengurusan Aset Tetap *(Fixed Asset Management)*	☐	☐	☐	☐	☐
16	Kawalan Inventori *(Inventory Control)*	☐	☐	☐	☐	☐
17	Ramalan *(Forecasting)*	☐	☐	☐	☐	☐

2. Penggunaan perisian dalam syarikat anda.
(The usage of software in your company)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan (*In-Planning*)	Tidak Berkaitan (*Not Applicable)*
1	Pemprosesan Perkataan *(Word Processing)*	☐	☐	☐	☐	☐
2	Lembaran Kerja *(Spread Sheet)*	☐	☐	☐	☐	☐
3	Pengkalan Data (*Database)*	☐	☐	☐	☐	☐
4	Perancangan Projek *(Project Planning)*	☐	☐	☐	☐	☐
5	Perancangan Sumber Manusia *(Human Resource Planning)*	☐	☐	☐	☐	☐
6	Mail Elektronik (*E-Mail*)	☐	☐	☐	☐	☐
7	Laman Web (*Website*)	☐	☐	☐	☐	☐

3. Siapakah yang membangunkan laman web syarikat anda?
(Who developed your website?)

☐ Luaran *(Outsourcing)*

☐ Dalaman *(In-House)*

☐ Tidak berkaitan *(Not applicable)*

4. Sekiranya syarikat anda mempunyai laman web tandakan (√) pada kotak yang sesuai.
(If your company has website, please tick (√) in the appropriate boxes for the following items)

Bil. *(No.)*	Item *(Item)*	*Tiada (None)*	*Jarang-Jarang (Seldom)*	*Kadang-Kadang (Sometimes)*	*Sentiasa (Often)*	*Kerapkali (Frequently)*
1	Perniagaan antara perniagaan *(Business to business)*	☐	☐	☐	☐	☐
2	Perniagaan antara pelanggan *(Business to customer)*	☐	☐	☐	☐	☐
3	Perniagaan antara kerajaan *(Business to government)*	☐	☐	☐	☐	☐

5. Adakah syarikat anda memperuntukkan perbelanjaan tahunan terhadap ICT?
(Does your company allocate yearly expenditure for ICT?)

☐ Ya *(Yes)*. Anggaran *(Estimation)* __________ %.

☐ Tidak *(No)*

BAHAGIAN C: PENGGUNAAN TEKNOLOGI
(PART C: TECHNOLOGY ADOPTION)

Sila tandakan (√) tahap automasi yang bersesuaian bagi setiap item yang disenaraikan.
(Please mark (√) the appropriate level of automation for each of the items listed)

a. Technology Kendiri
(Stand-alone Technology)

i. Teknologi kejuruteraan dan rekabentuk.
(Engineering technology and design)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	*Computer-aided design (CAD)*	☐	☐	☐	☐	☐
2	*Computer-aided Process Planning (CAPP)*	☐	☐	☐	☐	☐

ii. Teknologi mesin, fabrik dan pemasangan.
(Machine technology, fabric and assembling)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	*Numerical control/computer numerical control (NC/CNC)/digital numerical control (DNC) machines)*	☐	☐	☐	☐	☐
2	*Pick-and-place robots*	☐	☐	☐	☐	☐
3	*Others robots*	☐	☐	☐	☐	☐
4	*Material working laser*	☐	☐	☐	☐	☐

b.Teknologi Pertengahan
(Intermediate Technology)

i. Teknologi kawalan bahan
(Material control technology)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	*Storage and retrieval system (ASRS)*	☐	☐	☐	☐	☐
2	*Material handling system (AMHS)*	☐	☐	☐	☐	☐

ii. Pemeriksaan alatan pengujian
(Inspection and testing equipment)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	*Inspection and testing equipment*	☐	☐	☐	☐	☐

c. Teknologi Bersepadu
(Integrated Technology)

Bil. *(No.)*	Item *(Item)*	Manual Sepenuhnya *(Fully-Manual)*	Separuh Automasi *(Semi-Automated)*	Automasi Sepenuhnya *(Fully-Automated)*	Dalam Perancangan *(In-Planning)*	Tidak Berkaitan *(Not Applicable)*
1	*Flexible manufacturing cell/systems (FMC/FMS)*	☐	☐	☐	☐	☐
2	*Computer-integrated manufacturing (CIM)*	☐	☐	☐	☐	☐
3	*Material requirement planning (MRP)*	☐	☐	☐	☐	☐
4	*Just-in-time (JIT)*	☐	☐	☐	☐	☐
5	*Manufacturing resources planning*	☐	☐	☐	☐	☐

d. Adakah syarikat anda memperuntukkan perbelanjaan tahunan terhadap teknologi?
(Does your company allocate yearly expenditure for technology?)

☐ Ya *(Yes)*. Anggaran *(Estimation)* _________ %.

☐ Tidak *(No)*

BAHAGIAN D: PROGRAM LATIHAN
(PART D: TRAINING PROGRAMES)

1. LATIHAN KEMAHIRAN
(Skilled Training)

Nyatakan peratusan latihan kemahiran yang diberikan kepada pekerja syarikat anda.
(Please provide the percentage of skills training provided to your staff)

Bil. *(No.)*	Agensi yang melatih *(Training agency)*	Peratus (%) latihan kemahiran *(Percentage of skills training)*
1	Kerajaan *(Government)*	
2	Swasta *(Private)*	
3	Syarikat sendiri *(In-house)*	
	Jumlah (*Total)*	100 %

2. LATIHAN ICT
(ICT Training)

Sila tandakan (√) jenis kekerapan pada kotak yang bersesuaian.
(Please tick (√) the appropriate boxes on the types of frequency based on the following items)

a. Latihan Pentadbiran
(Administration Training)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	Teknologi maklumat *(Information technology)*	☐	☐	☐	☐	☐
2	Latihan berorientasikan kerja *(Job based training)*	☐	☐	☐	☐	☐
3	Perkhidmatan pelanggan/perhubungan awam (*Customer service/public relations)*	☐	☐	☐	☐	☐
4	Pemasaran/Publisiti *(Marketing/publicity)*	☐	☐	☐	☐	☐
5	Kursus latihan/penyegaran semula (*Training/refresher courses)*	☐	☐	☐	☐	☐
6	Kemahiran pengurusan *(Management skills)*	☐	☐	☐	☐	☐

b. Latihan Operasi
(Operation Training)

Sila tandakan (√) jenis operasi yang bersesuaian.
(Please tick (√) the appropriate boxes on the types of operation based on the following items)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	Kawalan bahan (*Material control)*	☐	☐	☐	☐	☐

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
2	Penjadualan Perancang *(Scheduling)*	☐	☐	☐	☐	☐
3	Penjualan (*Selling)*	☐	☐	☐	☐	☐
4	Pembangunan Produk (*Product Development)*	☐	☐	☐	☐	☐
5	Operasi Pengeluaran *(Production Operation)*	☐	☐	☐	☐	☐
6	Pengambilan Sumber Manusia *(Human Resource Recruitment)*	☐	☐	☐	☐	☐
7	Pengurusan Projek *(Project Management*)	☐	☐	☐	☐	☐
8	Pengedaran *(Distribution)*	☐	☐	☐	☐	☐
9	Pembekalan *(Supplies)*	☐	☐	☐	☐	☐
10	Invois/Bil *Invoice/Billing)*	☐	☐	☐	☐	☐
11	Pemasaran/Pengiklanan (*Marketing/Advertising)*	☐	☐	☐	☐	☐
12	Kawalan Kredit (*Credit Control*)	☐	☐	☐	☐	☐
13	Perkhidmatan Pelanggan (*Customer Service)*	☐	☐	☐	☐	☐
14	Kejuruteraan (*Engineering)*	☐	☐	☐	☐	☐
15	Pengurusan Aset Tetap *(Fixed Asset Management)*	☐	☐	☐	☐	☐
16	Kawalan Inventori (*Inventory Control)*	☐	☐	☐	☐	☐
17	Ramalan *(Forecasting)*	☐	☐	☐	☐	☐

3. LATIHAN OPERASI TEKNOLOGI
(*OPERATIONS TECHNOLOGY TRAINING)*

Sila tandakan (√) jenis latihan operasi teknologi yang bersesuaian.
(Please tick (√) the appropriate boxes on the types of operation technology training based on the following items)

a. Teknologi Kendiri
(*Stand-Alone Technology)*

i. Latihan teknologi kejuruteraan dan rekabentuk
(Engineering technology and design training)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Computer-aided design (CAD)*	☐	☐	☐	☐	☐
2	*Computer-aided process planning (CAPP)*	☐	☐	☐	☐	☐

ii. Kemahiran teknologi mesin, fabrik dan pemasangan
(Machine technology skill, fabric and assembling)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Numerical control/ computer numerical control (NC/CNC)/ digital numerical control*	☐	☐	☐	☐	☐
2	*Pick-and-place robots*	☐	☐	☐	☐	☐
3	*Others robots*	☐	☐	☐	☐	☐
4	*Material working laser*	☐	☐	☐	☐	☐

b. Teknologi Pertengahan
(*Intermediate Technology)*

i. Teknologi kawalan bahan secara automasi
(Automated technology material control)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Automatic storage and retrievel system (AS/RS)*	☐	☐	☐	☐	☐
2	*Automated material handling system (AMHS)*	☐	☐	☐	☐	☐

ii. Pemeriksaan dan pengujian secara automasi sepenuhnya
(Fully automated inspection and testing training)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Fully automated inspection and testing equipment*	☐	☐	☐	☐	☐

c. Teknologi Bersepadu
(Integrated Technology)

i. Kemahiran perkilangan fleksibel
(Flexible manufacturing skill)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Flexible manufacturing cell/systems (FMS).*	☐	☐	☐	☐	☐

ii. Kemahiran komputer-integrasi pembuatan
(Computer integrated-manufacturing skill))

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Computer-intergrated manufacturing (CIM)*	☐	☐	☐	☐	☐

iii. Kemahiran logistik-teknologi berkaitan
(*Logistic skill-applicable technology)*

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Material requirement planning (MRP)*	☐	☐	☐	☐	☐

iv. Kemahiran pengurusan/teknologi maklumat
(Management information technology training)

Bil. *(No.)*	Item *(Item)*	Tiada *(None)*	Jarang-jarang *(Seldom)*	Kadang-kadang *(Sometimes)*	Sentiasa *(Often)*	Kerapkali *(Frequently)*
1	*Just-in-time (JIT)*	☐	☐	☐	☐	☐
2	*Manufacturing*	☐	☐	☐	☐	☐
3	*Manufacturing resources planning (MRP11)*	☐	☐	☐	☐	☐

4. Sila nyatakan anggaran peratusan peruntukkan berdasarkan pendapatan kasar tahunan syarikat terhadap latihan teknologi dan ICT.
(Please state your estimated percentage of budget allocation on technology and ICT training based on the firm's yearly gross income)

a) Peruntukan latihan teknologi __________%
(Technology training budget)

b) Peruntukan latihan untuk ICT _________ %
(ICT training budget)

BAHAGIAN E: PENGUKURAN PRODUKTIVITI SYARIKAT
(PART E: MEASUREMENT OF COMPANY'S PRODUCTIVITY)

Sila tentukan jenis syarikat anda dengan menandakan (√) pada kotak yang bersesuaian di bawah.
(Please identify the nature of your company by ticking (√) appropriate box)

i) Berasaskan pengeluaran
(Based on production)

☐ Sila jawab Bah. (a)
(Please answer part (a)

ii) Berasaskan perkhidmatan atau projek
(Based on services or project)

☐ Sila jawab Bah. (b)
(Please answer part (b)

iii) Kedua-dua

☐ Sila jawab Bah. (a) dan Bah. (b)
(Please answer part (a) and part (b)

Bahagian (a); Menerangkan produktiviti syarikat yang berasaskan pengeluaran selepas mengambilkira kesan penggunaan Teknologi dan Teknologi Komunikasi & Maklumat (ICT)
(*To describe the effect of company's productivity based on production after the adoption of Technology and ICT)*

Bil. *(No.)*	Item *(Item)*	Tidak Berkaitan *(Not Applicable)*	Sangat Rendah *(Verry Low)*	Rendah *(Low)*	Sederhana *(Moderate)*	Tinggi *(High)*	Sangat Tinggi *(Verry High)*
1	Pengurangan penghantaran pada masa mendulu *(Reduction in delivery leadtimes)*	☐	☐	☐	☐	☐	☐
2	Pengurangan masa untuk perubahan rekabentuk terhadap produk yang sedia ada. *(Reduction in time for design changes for an existing product)*	☐	☐	☐	☐	☐	☐
3	Meningkatkan hasil daripada operasi kilang *(Increase in revenues from manufacturing operations)*	☐	☐	☐	☐	☐	☐
4	Meningkatkan kepelbagaian produk perkilangan *(Increased variety of products manufactured)*	☐	☐	☐	☐	☐	☐
5	Keupayaan untuk memperbaiki mutu produk *(Ability to improve product quality)*	☐	☐	☐	☐	☐	☐

Bil. *(No.)*	Item (*Item*)	Tidak Berkaitan *(Not Applicable)*	Sangat Rendah *(Very Low)*	Rendah *(Low)*	Sederhana *(Moderate)*	Tinggi *(High)*	Sangat Tinggi *(Very High)*
6	Kos per unit buruh berkurang *(Reduction in per unit labor cost)*	☐	☐	☐	☐	☐	☐
7	Kemampuan memenuhi permintaan produk *(Ability to fulfil a product demand)*	☐	☐	☐	☐	☐	☐
8	Keupayaan untuk meningkatkan pengetahuan dan kemahiran yang melibatkan pekerja yang bersesuaian) *(Ability to enhance knowledge and skill of the workers)*	☐	☐	☐	☐	☐	☐
9	Keupayaan untuk meningkatkan perkhidmatan kualiti *(Ability to increasing quality of services)*	☐	☐	☐	☐	☐	☐
10	Pengurangan ke arah *zero defect*	☐	☐	☐	☐	☐	☐
11	Keupayaan untuk meningkatkan kapasiti terhadap kuantiti dan kualiti perkhidmatan *(Ability to increasing quantity and quality of services)*	☐	☐	☐	☐	☐	☐
12	Kemampuan mengubah saiz lot pengeluaran *(Ability to change production lot sizes)*	☐	☐	☐	☐	☐	☐
13	Pengurangan dalam perubahan masa peralihan pengeluaran *(Reduction in production changeover times)*	☐	☐	☐	☐	☐	☐
14	Pengurangan masa antara konsep pembentukan produk kepada pengeluaran produk baru. *(Reduction in time between conceptualization and production of new product)*	☐	☐	☐	☐	☐	☐
15	Peningkatan kadar output operator pengeluaran	☐	☐	☐	☐	☐	☐

Bahagian (b); Menerangkan produktiviti syarikat yang BUKAN berasaskan pengeluaran selepas mengambilkira kesan penggunaan Teknologi dan Teknologi Komunikasi & Maklumat (ICT)
(*To describe the effect of company's productivity NOT based on production after the adoption of Technology and ICT)*

Bil. *(No.)*	Item *(Item)*	Tidak Berkaitan *(Not Applicable)*	Sangat Rendah *(Very Low)*	Rendah *(Low)*	Sederhana *(Moderate)*	Tinggi *(High)*	Sangat Tinggi *(Very High)*
1	Keupayaan untuk memperbaiki mutu produk *(Ability to improve product quality)*	☐	☐	☐	☐	☐	☐
2	Kos per unit buruh berkurang *(Reduction in per unit labor cost)*	☐	☐	☐	☐	☐	☐
3	Kemampuan memenuhi permintaan produk *(Ability to fulfil a product demand)*	☐	☐	☐	☐	☐	☐
4	Keupayaan untuk meningkatkan pengetahuan dan kemahiran yang melibatkan pekerja yang bersesuaian) *(Ability to increasing knowledge and skill of the workers)*	☐	☐	☐	☐	☐	☐
5	Keupayaan untuk meningkatkan perkhidmatan kualiti *(Ability to increasing quality of services)*	☐	☐	☐	☐	☐	☐
6	Pengurangan ke arah *zero defect*	☐	☐	☐	☐	☐	☐
7	Keupayaan untuk meningkatkan kapasiti terhadap kuantiti dan kualiti perkhidmatan *(Ability to increasing quantity and quality of services)*	☐	☐	☐	☐	☐	☐
8	Peningkatan kadar output projek dan services *(Increasing operator output rates)*	☐	☐	☐	☐	☐	☐

Kami mengalu-alukan sebarang komen berhubung dengan soal selidik ini.
(We welcome any comments pertaining to this survey)

TERIMA KASIH
(THANK YOU)

PART D TRAINING PROGRAMS

Administration Training

Table ??? Correlation of Administration Training and Firm Size

Variable		r
Information technology	Correlation Coefficient	.230(**)
	Sig. (1-tailed)	.006
Job base training	Correlation Coefficient	.232(**)
	Sig. (1-tailed)	.005
Customer service/public relations	Correlation Coefficient	-.012
	Sig. (1-tailed)	.449
Marketing/publicity	Correlation Coefficient	-.012
	Sig. (1-tailed)	.449
Training/refresher courses	Correlation Coefficient	.213(**)
	Sig. (1-tailed)	.010
Management skills	Correlation Coefficient	.141
	Sig. (1-tailed)	.062

** Correlation is significant at the 0.01 level (1-tailed).

Table ___ shows the correlation between employee size and the following independent variables: information technology (IT), job base training, customer service/public relations, marketing/publicity, training/refresher courses, and management skills.

As the data disclosed, three variables had a positive and statistically significant correlation to employee size, namely (a) IT, (b) job base training, and (c) training/refresher courses. Of these variables, job base training had the strongest positive correlation, as shown by the r-value of 0.232 ($p = 0.005$). This was closely followed by IT, with an r-value of 0.230 ($p = 0.006$), then training/refresher courses ($r = 0.213$, $p = 0.010$).

The findings suggest that size of the company contributes significantly to the amount of training-related activities in the areas of IT, job base training, and training/refresher courses. It may also be said that the more employees there are in the company, the higher is the demand for activities specifically on information technology, the need to widen job-based training as well as for training/refresher courses. Larger companies tend to have more training activities when compared to smaller companies, and that job-based training is more in demand when compared to IT and training/refresher courses.

Operation Training

Table ??? Correlation of Operations Training and Firm Size

Variable		**r**
Material control	Correlation Coefficient	.386(**)
	Sig. (1-tailed)	.000
Scheduling	Correlation Coefficient	.213(**)
	Sig. (1-tailed)	.010
Selling	Correlation Coefficient	.204(*)
	Sig. (1-tailed)	.013
Product development	Correlation Coefficient	.255(**)
	Sig. (1-tailed)	.002
Production operation	Correlation Coefficient	.280(**)
	Sig. (1-tailed)	.001
Human resource recruitment	Correlation Coefficient	.303(**)
	Sig. (1-tailed)	.000
Project management	Correlation Coefficient	.118
	Sig. (1-tailed)	.100
Distribution	Correlation Coefficient	.157(*)
	Sig. (1-tailed)	.043
Supplies	Correlation Coefficient	.193(*)
	Sig. (1-tailed)	.018
Invoice/billing	Correlation Coefficient	.105
	Sig. (1-tailed)	.127
Marketing/advertising	Correlation Coefficient	.097
	Sig. (1-tailed)	.146
Credit control	Correlation Coefficient	.067
	Sig. (1-tailed)	.235
Customer service	Correlation Coefficient	.124
	Sig. (1-tailed)	.088
Engineering	Correlation Coefficient	.426(**)
	Sig. (1-tailed)	.000
Fixed aset management	Correlation Coefficient	.145
	Sig. (1-tailed)	.057
Inventory control	Correlation Coefficient	.186(*)
	Sig. (1-tailed)	.021

Forecasting	Correlation Coefficient	.249(**)
	Sig. (1-tailed)	.003

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

Table ??? shows the correlation between the various operation activities and employee size. As can be seen, eleven variables had a positive correlation to employee size, with seven variables had correlations at 0.01 level of significant, whilst the remaining four at 0.05 level of significant. In the order of highest positive correlation, Engineering operations appears to have the strongest correlation at r = 0.426 (p = 0.000). This is followed by Material Control with an r-value of 0.386 (p = 0.000), Human Resource Recruitment (r = 0.303, p = 0.000), Production Operation (r = 0.280, p = 0.001), Product Development (r = 0.255, p = 0.002), Forecasting (r = 0.249, p = 0.003), Scheduling (r = 0.213, p = 0.010), Selling (r = 0.204, p = 0.013), Supplies (r = 0.193, p = 0.018), Inventory Control (r = 0.186, p = 0.021), and Distribution (r = 0.157, p = 0.043). For the rest of the operation activities, such as Project Management, Invoice/Billing, Marketing/Advertising, Credit Control, Customer Service, and Fixed Asset Management, the data suggests no evidence of significant correlations with employee size.

The findings suggest the size of the company is related significantly to the Operations training activities in the areas of Engineering, Material Control, Human Resource Recruitment, Production Operation, Product Development, Forecasting, and Scheduling. To a lesser extend, the other Operation training such as Selling, Supplies, Inventory Control, and Distribution are also related to the size of the company at significant levels of at least 0.05. It is interesting to note that most of the highly correlated training came from operational areas in the production and manufacturing. This suggests that larger companies tend to have highly complex and sophisticated production and manufacturing activities, perhaps involving high-technology machineries that require large amount of training.

Looking at the magnitude of correlation, it appeared that engineering, material control, and human resource recruitment were the variables that demonstrated the strongest correlation to employee size. Likewise, the positive correlations to employee size of these and all other variables indicate that larger enterprises tended to have more needs of, or demands for, training on engineering, material control, and human resource recruitment, among others. These elevated needs or demands may be rationalized by the bulk of business operations that larger organizations had to contend with in dealing with customers, workers, and the public at large when compared to smaller businesses. The findings may also suggest that larger organizations, such as those involved in the present research, were very much engaged in operations training that dealt with the variables that were statistically significantly correlated to employee size. Put it simply, employee size had a significant bearing on operations training, more specifically on the preceding variables mentioned.

Stand Alone Technology

Table ??? Correlations of Stand Alone Technology and Firm Size

Variable		r
Computer-aided design (CAD)	Correlation Coefficient	.274(**)
	Sig. (1-tailed)	.001
Computer-aided process planning (CAPP)	Correlation Coefficient	.284(**)
	Sig. (1-tailed)	.001
Numerical control/computer numerical control NC/CNC/digital numerical control	Correlation Coefficient	.314(**)
	Sig. (1-tailed)	.000
Pick-and-place robots	Correlation Coefficient	.288(**)
	Sig. (1-tailed)	.001
Others robots	Correlation Coefficient	.293(**)
	Sig. (1-tailed)	.001
Material working laser	Correlation Coefficient	.225(**)
	Sig. (1-tailed)	.007

** Correlation is significant at the 0.01 level (1-tailed).

The correlations between the various Stand Alone Technology products and size of company show positive and significant correlations in all the stand alone products at p = 0.001 level of significant. The highest correlation is Numerical Control/Computer Numerical Control NC/CNC machines with an r-value of 0.314. Next is Robots with an r-value of 0.293 for Other Robots category, and an r-value of 0.288 for Pick-and-place Robots. This is followed by Computer-Aided Process Planning (CAPP) at r = 0.284, Computer-Aided Design (CAD) at r = 0.274, and Material Working Laser at r = 0.225.

The positive correlations suggest that larger companies had more inclination to utilize the preceding forms of stand-alone technology when compared to smaller enterprises. Understandably, big companies may have business operations that require special or unique stand-alone technologies that may not be at all necessary in smaller entities.

Intermediate Technology

Table ??? Correlations of Intermediate Technology and Firm Size

Variable		r
Automatic storage and retrievel system (AS/RS)	Correlation Coefficient	.333(**)
	Sig. (1-tailed)	.000
Automated material handling system (AMHS)	Correlation Coefficient	.326(**)
	Sig. (1-tailed)	.000
Fully automated inspection and testing equipment	Correlation Coefficient	.260(**)
	Sig. (1-tailed)	.002

** Correlation is significant at the 0.01 level (1-tailed).

Similar to Stand Alone Technology, all products categorized under the Intermediate Technology also had highly positive correlations with size of the employee. Topped the list is Automatic Storage and Retrieval Systems (AS/RS) with an r-value of 0.333. This is followed closely by Automated Material Handling System (AMHS) at r = 0.326, and Fully Automated Inspection and Testing Equipment (FAITE) at r = 0.260. All three intermediate technology products are significant at the 0.001 level.

The positive correlations suggest that the larger the company, the more that they would require intermediate technologies such as AS/RS and AMHS, and to utilize full automation in inspection and testing equipment when compared to smaller companies. The need for intermediate technologies may be expected as larger companies would tend to require AS/RS, AMHS, and fully automated inspection and testing equipment in their business operations when compared to smaller companies.

Integrated Technology

Table ??? Correlations of Integrated Technology and Firm Size

Variable		r
Flexible manufacturing cell system (FMS)	Correlation Coefficient	.339(**)
	Sig. (1-tailed)	.000
Computer-integrated manufacturing (CIM)	Correlation Coefficient	.286(**)
	Sig. (1-tailed)	.001
Material requirement planning (MRP)	Correlation Coefficient	.414(**)
	Sig. (1-tailed)	.000
Just-in-time (JIT)	Correlation Coefficient	.281(**)
	Sig. (1-tailed)	.001
Manufacturing	Correlation Coefficient	.392(**)
	Sig. (1-tailed)	.000
Manufacturing resources planning (MRP11)	Correlation Coefficient	.358(**)
	Sig. (1-tailed)	.000

** Correlation is significant at the 0.01 level (1-tailed).

In addition to stand-alone and intermediate technologies, this research also found statistically significant correlations between employee size and integrated technologies, in particular, flexible manufacturing cell systems (FMS), computer-integrated manufacturing (CIM), material requirement planning (MRP), jut-in-time (JIT), manufacturing, and manufacturing resources planning (MRP11). This finding is supported by p-values which were all statistically significant at the 0.01 significance level. In terms of the strength of correlation, MRP (r = 0.414) tended to have the strongest relationship with employee size, implying that this is the foremost type of integrated technology that larger companies would need and utilize in their business operations when compared to smaller companies which may not need often such technology. Nevertheless, all other forms of integrated technology considered in this study also had a statistically significant correlation with employee size, suggesting their relative importance to the operations of larger companies when compared to that of smaller companies. As larger companies may have a much wider spectrum of business activities, operational needs, and strategic actions, the need to utilize integrated technologies in their business operations is much more necessary than smaller companies.

The findings show that in the high-technology areas, all the products listed under the Stand Alone, Intermediate and Integrated technologies are significant and positively correlated to the size of the company. These suggest that larger sized companies tend to use automation and high technology products to support their operations. This also indicates that companies today are embarking on automation to increase productivity, and quality and precision of their products to enable them to compete and sustain their profitability.