CHAPTER 13 - INFORMATION AND COMMUNICATIONS TECHNOLOGY

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Chapter 13

Information and Communications Technology

13 INFORMATION AND COMMUNICATIONS TECHNOLOGY

I. INTRODUCTION

13.01 The necessary infrastructure and environment for the development of information and communications technology (ICT) was in place during the Seventh Plan period to enable Malaysia to move rapidly into the Information Age. The National IT Agenda (NITA), formulated in 1996, provided the framework for the orderly development of the country into an information and knowledge-based society by 2020. As ICT presented the best opportunities to increase productivity and improve competitiveness, several programmes and projects were implemented to encourage a wider diffusion of ICT in the economy. A key initiative was the Multimedia Super Corridor (MSC), which was designated as a world test-bed for ICT development. In addition, a set of world-leading cyberlaws was enacted to provide an enabling environment for the development of ICT. The main cyberlaw was the Communications and Multimedia Act 1998, aimed at promoting deregulation, streamlining licensing procedures and categories as well as facilitating market liberalization.

13.02 During the Eighth Malaysia Plan, more concerted efforts will be undertaken to position Malaysia as a competitive knowledge-based economy, with ICT facilitating the development. In this regard, the ICT infrastructure will be expanded, particularly to rural areas to bridge the digital divide and enable all citizens to have equitable access to knowledge and information. As the knowledge-based economy requires new skills, competencies and broadband connections for advanced multimedia applications, emphasis will be given to human resource development and network infrastructure to enable Malaysians to benefit fully from rapid technological developments.

II. PROGRESS, 1996-2000

13.03 The ability to create, distribute and exploit knowledge and information is often regarded as the single most important factor underlying economic growth and improvements in the quality of life. Recognizing that ICT is an important enabling tool towards achieving this objective, the Government undertook various initiatives during the Seventh Plan to facilitate the greater adoption and diffusion of ICT to improve capacities in every field of business, industry and life in general. These included the provision of incentives for computerization and automation, creation of venture capital funds, enhancement of education and training programmes, and the provision of an enabling legal environment to facilitate the development of ICT.

Utilization of ICT

13.04 The Seventh Plan period saw a rapid growth in ICT utilization. Investments in ICT expanded at a rate of 9.2 per cent per annum from RM3.8 billion in 1995 to RM5.9 billion in 2000. This was largely due to the increasing awareness of Malaysians to the importance of production, diffusion and utilization of knowledge and information for improving competitiveness and overall economic performance. The provision of special incentives such as the abolition of sales tax on computers and components, and the granting of accelerated capital allowance for expenses on computers and other ICT equipment also assisted in increasing the usage of ICT.

13.05 The manufacturing sector recorded the highest investments in ICT amounting to almost RM1.2 billion or 20 per cent of total ICT expenditure in 2000, as shown in *Table 13-1*. This was followed by the banking and finance sector with 14 per cent and distribution with 11 per cent. The Government sector also invested substantially in ICT with investments totalling RM532 million in 2000, representing 9.0 per cent of total ICT expenditure. The home sector recorded the highest rate of growth of 44.1 per cent per annum in ICT expenditure during the Plan period.

13.06 In a study undertaken in 1998 to address several broad policy concerns in the manufacturing sector, it was revealed that the use of ICT was most prevalent for administration, payroll and finance functions. This was followed by ICT for communications, control and logistics, and production process. About

28 per cent of local firms used ICT for administration and finance compared with 7.0 per cent using ICT for control and production. Production-related ICT such as industrial robots and flexible manufacturing systems were more common among large companies and foreign firms. The study also found that the diffusion and increasing use of ICT had a positive impact on firm-level productivity and productivity growth.

13.07 There was also an extensive utilization of ICT in the energy sector. The use of ICT in petroleum development, both in the upstream, particularly in hydrocarbon exploration and development as well as in downstream activities resulted in cost minimization. In the electricity subsector, the applications of ICT contributed to the improvement in system security and reliability as well as in customer services. The completion by *Tenaga Nasional Berhad* of Phase I of the digitalized and computerized system and automation of the National Load Despatch Centre and the Regional Control Centres led to a substantial reduction in interruptions

TABLE 13-1

ICT EXPENDITURE BY SECTOR, 1995–2000
(RM million)

Sector	*1995*	*%*	*2000*	*%*	*1996-2000*	*%*	*Average Annual Growth Rate (%), 1996-2000*
Banking & Finance	1,026	*27.2*	827	*14.0*	3,723	*15.0*	*-4.2*
Manufacturing	494	*13.1*	1,182	*20.0*	4,041	*16.3*	*19.0*
Government	380	*10.1*	532	*9.0*	2,062	*8.3*	*6.9*
Telecommunications	-	-	473	*8.0*	2,323	*9.3*	-
Distribution	304	*8.1*	650	*11.0*	2,586	*10.4*	*16.4*
Oil & Gas	380	*10.1*	296	*5.0*	1,623	*6.5*	*-4.8*
Utilities	266	*7.0*	236	*4.0*	1,253	*5.0*	*-2.3*
Professional ICT & Other Services	125	*3.3*	236	*4.0*	236	*1.0*	*13.5*
Healthcare	-	-	59	*1.0*	59	*0.2*	-
Education & Research	114	*3.0*	236	*4.0*	1,008	*4.0*	*15.6*
Transportation	114	*3.0*	177	*3.0*	1,147	*4.6*	*9.1*
Home	76	*2.0*	473	*8.0*	2,004	*8.0*	*44.1*
Plantation & Mining	76	*2.0*	-	-	100	*0.4*	-
Others	418	*11.1*	532	*9.0*	2,736	*11.0*	*4.9*
Total	**3,773**	***100.0***	**5,909**	***100.0***	**24,901**	***100.0***	***9.2***

Source: Computer Industry Association of Malaysia (PIKOM)

incidences and transmission losses. The utilization of state-of-the-art technologies in both the petroleum and electricity subsectors contributed to productivity improvements in the energy sector.

13.08 The extent of ICT usage was also measured in terms of personal computers (PC) and Internet penetration rates. The number of PCs installed rose dramatically from 610,000 in 1995 to 2.2 million in 2000, as shown in *Table 13-2*. The number of PCs per 1,000 population also rose from 29.5 in 1995 to 95.7 in 2000. The Plan period also saw an increasing usage of the Internet by households and companies. The number of Internet subscribers increased from 13,000 in 1995 to about 1.2 million in 2000, a phenomenal rate of growth of 145.2 per cent per annum. In terms of state distribution, *Table 13-3* shows that Wilayah Persekutuan Kuala Lumpur had the highest number of Internet subscribers per 1,000 population at 103.9, followed by Selangor with 84.9 in 2000. The States of Sabah and Kelantan had the lowest number of Internet subscribers per 1,000 population, at 16.6 and 12.5 respectively. TMNet, Maxisnet and JARING were the Internet Service Providers (ISP) in the country. Despite the phenomenal growth, the penetration rates were still low at 9.0 per cent of the population for PCs and 7.0 per cent for the Internet.

13.09 Several programmes and projects were implemented by the Government as part of the efforts to increase ICT usage among the population. The *Gerakan Desa Wawasan* was launched in 1996 to increase the awareness of the rural population to participate actively in bringing about change and development to their areas. Under this programme, the Village Development and Security Committees were given computer facilities not only to assist in the management and administration of the villages but as an initial step to introduce ICT at the village level. By the end of 2000, a total of 995 villages benefited from this programme. The *Internet Desa* programme was launched in March 2000 at two pilot locations, namely, Sg. Ayer Tawar, Selangor and Kanowit, Sarawak. The programme involved the provision of ICT infrastructure at post offices and the launching of web sites that provided information on government services, local events and activities as well as free electronic mail (e-mail) and Internet facilities. Initial evaluation revealed that there were 55 to 70 users per week, many of whom were students. By the end of the Plan period, 12 such centres were implemented throughout the country. Another project that was implemented to promote ICT awareness and usage was the E-Bario project initiated by the *Universiti Malaysia Sarawak* (Unimas). Under this project, computers and Internet access were provided to schools to become community centres for learning.

TABLE 13-2

SELECTED ICT INDICATORS, 1995 AND 2000

Indicator	*1995*	*2000*
Newspaper Circulation Per 1,000 Population	162	159[1]
Telex Subscribers	6,578	3,105[2]
Personal Computers (units installed)	610,000	2,200,000
Personal Computers Per 1,000 Population	29.5	95.7
Telephone Lines Per 1,000 Population	161.07	204.76[2]
Telephone Subscribers	3,332,447	4,650,410[2]
Mobile Phones	700,000	2,265,000[2]
Number of Internet Subscribers	13,064[3]	1,157,384
Number of Internet Users	30,000	4,000,000

Sources: Ministry of Energy, Communications and Multimedia, PIKOM, World Development Report, 1999/2000 and World Competitiveness Yearbook, 2000

Notes:

[1] Refers to 1998.

[2] Refers to 1999.

[3] JARING only.

13.10 As part of the effort to encourage greater utilization of ICT, contributors to the Employees Provident Fund were allowed to withdraw their savings for the purchase of computers. Since the introduction of this scheme in October 1999, a total of 245,460 applications was received, of which 199,293 were approved involving a total sum of RM665.3 million. In addition, the Government, with the cooperation of the industry, organized the PC Ownership Campaign starting year 2000 with the aim of 'one home, one PC'. During this campaign, PC fairs were held offering PCs at cheaper prices to the public.

National IT Agenda

13.11 The National IT Agenda, aimed at transforming the nation into a knowledge-based society in line with Vision 2020, focused on human development and leveraging on the public-private sectors partnership. The framework was based on the balanced development of three key elements, namely, people, infostructure and applications.

TABLE 13-3

INTERNET SUBSCRIBERS BY STATE, 2000

State	*Total Subscribers*	*%*	*Subscribers Per 1,000 Population*
Johor	77,747	*8.8*	30.3
Kedah	28,494	*3.2*	18.1
Kelantan	16,101	*1.8*	12.5
Melaka	17,234	*2.0*	28.6
Negeri Sembilan	22,373	*2.6*	27.0
Pahang	21,682	*2.5*	18.0
Perak	55,345	*6.3*	27.3
Perlis	3,710	*0.4*	18.7
Pulau Pinang	63,648	*7.3*	51.9
Sabah	40,692	*4.6*	16.6
Sarawak	43,219	*5.0*	21.5
Selangor	335,262	*38.2*	84.9
Terengganu	15,041	*1.7*	17.1
Wilayah Persekutuan Kuala Lumpur	134,870	*15.4*	103.9
Wilayah Persekutuan Labuan	1,355	*0.2*	19.2
Malaysia	**876,773**[1]	***100.0***	**39.5**

Source: Ministry of Energy, Communications and Multimedia

Note: [1] Excluding Maxisnet.

13.12 In order to achieve the goals of NITA, the National IT Council (NITC) launched the Strategic Thrusts Agenda with the primary objective of effectively facilitating the migration of Malaysians and institutions into the emerging networked global environment. Five strategic thrust areas were identified, namely, E-Economy, E-Public Services, E-Community, E-Learning and E-Sovereignty. Under the E-Economy strategic thrust area, all sectors of the economy were envisioned to create value and wealth through the successful participation in the emerging knowledge-driven global economy. With E-Public Services, focus was given to the provision of people-oriented customer-focused services electronically. To facilitate the interaction and communication among communities to improve the quality of life, E-Community was formulated while E-Learning was to focus on cultivating a lifelong learning culture. Meanwhile, E-Sovereignty focused on building a resilient national identity in the face of challenges to the nation. The

NITC also established the Strategic Thrusts Implementation Committee (STIC) to operationalize the Strategic Thrusts Agenda. Since its establishment, STIC managed to galvanize the public and private sectors to implement 30 projects. Examples of such projects included the E-Community Resource Exchange, National Grid of Learning, ICT Community Chest and SJ2005.

13.13 In an attempt to develop an information and knowledge-based society, the NITC held Information Society (InfoSoc) conference and exposition events annually, aimed at providing a framework and platform for dialogues and exchange of national and international experiences on ICT as well as to raise the awareness of the Malaysian public about Information Age developments. In this endeavour, the Government in collaboration with Global Knowledge Partnership, also hosted the Second Global Knowledge Conference (GKII) in March 2000 in Kuala Lumpur to deliberate on issues pertaining to developing a knowledge-based society through ICT developments.

13.14 To facilitate the realization of NITA, the Demonstrator Applications Grant Scheme (DAGS) was established in April 1998. DAGS aimed at promoting the use of ICT and multimedia for socio-economic development through developing communities enabled by electronic networks. During the Plan period, 37 community-based projects were implemented involving an expenditure of RM48 million. E-Thalassaemia, NutriWeb, CyberCare and *Masjid* as a Neighbourhood Centre were examples of DAGS projects.

Development of the Multimedia Super Corridor

13.15 Realizing the need to drive the economy towards higher productivity through information technology and high value-added economic activities, the MSC was established in 1996 to provide a comprehensive world-class ICT-enabled working and living environment to catalyze the development of a knowledge-based economy. As a global test-bed for innovative solutions, the enabling environment and incentives provided sought to attract leading global webshapers to use MSC as a hub as well as help spawn both local and foreign small- and medium-sized enterprises (SMEs). The interaction of foreign and local companies would create new value through the introduction of globally competitive, cutting-edge products and services and by increasing productivity in the economy. The MSC aimed at catalyzing a highly competitive cluster of Malaysian ICT companies nurtured to become world-class over time. To attract such investments, the Multimedia Development Corporation (MDC) was established as a one-stop agency to promote the overall development of the MSC. In addition, the MSC

International Advisory Panel comprising prominent business leaders, policy makers and scholars from the global ICT industry was set up to provide advice on the further development of the MSC.

13.16 Companies with strong value-added activities, which were providers or heavy users of multimedia products and services, were given MSC status and enjoyed certain privileges and incentives offered under the Bill of Guarantees. These included the freedom of ownership, unrestricted employment of foreign knowledge workers, and freedom of sourcing capital globally. They were provided with competitive financial incentives including income tax exemption for up to 10 years or a 100 per cent investment tax allowance for five years. They were also eligible to tender for key MSC infrastructure contracts. By the end of 2000, a total of 429 companies was granted MSC status. Of this total, 274 were Malaysian-owned companies, as shown in *Chart 13-1*.

13.17 As part of the effort to attract a sizeable number of world-class technology-led companies to Malaysia through the creation of an enabling multimedia environment, five cybercities were being developed in the MSC, namely, at Cyberjaya, Technology Park Malaysia, *Universiti Putra Malaysia*-Malaysian Technology Development Corporation (UPM-MTDC), Petronas Twin Towers and KL Tower. Cyberjaya was designed and developed for living as well as working in a multimedia environment. A city command centre would be set up in Cyberjaya, involving the integration of 23 systems, to function as a nucleus or city hub. In addition, Wilayah Persekutuan Putrajaya became the new administrative capital of Malaysia where the concept of electronic government was introduced.

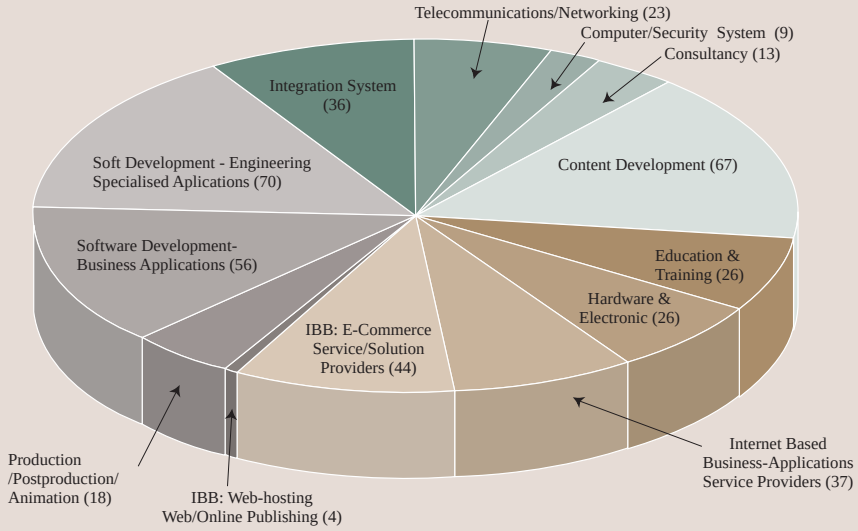
MSC Flagship Applications

13.18 To jump start the development of MSC, seven flagship applications were introduced to provide business opportunities for private sector participation. These flagship applications were categorized into two groups, namely multimedia development flagship applications and multimedia environment flagship applications. The multimedia development applications included electronic government, smart schools, multipurpose cards and telehealth while research and development (R&D) cluster, worldwide manufacturing web and borderless marketing were applications to create the multimedia environment. These applications attracted international market appeal. Countries such as Algeria, Botswana, Lebanon, Mozambique and Syria expressed interest in the various telehealth and electronic government applications. There were also ongoing initiatives to replicate the smart school model in a number of countries including Sri Lanka and South Africa.

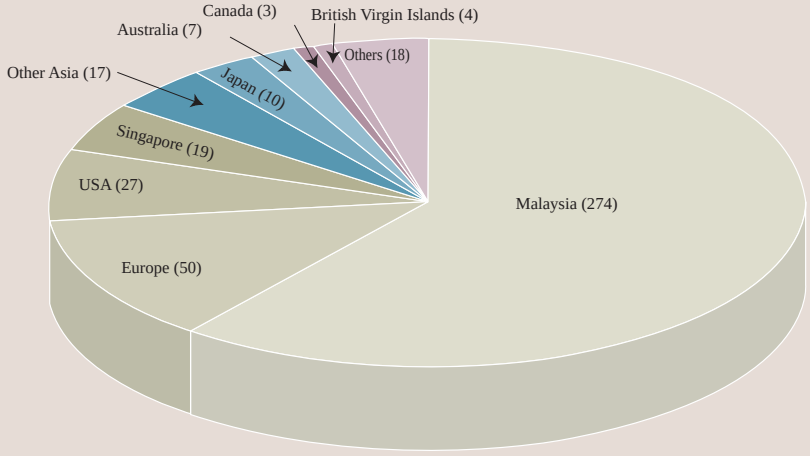
CHART 13-1

APPROVED MSC-STATUS COMPANIES BY SECTOR AND COUNTRY (AS OF 31 DECEMBER 2000)

Sector



Country



Source: Multimedia Development Corporation.

13.19 The *electronic government* (EG) flagship application was launched with the objective of improving government operations in terms of its internal processes and delivery of services to the public and to business. Leading-edge ICT technologies and solutions were to enable such change and reinvent the way Government operated. Under this flagship, six pilot projects were implemented, namely, the Electronic Services (E-Services), Electronic Procurement (EP), Generic Office Environment (GOE), Human Resources Management Information System (HRMIS), Project Monitoring System (PMS) and the Electronic Labour Exchange (ELX).

13.20 The E-Services project covered a range of services such as the issuance and renewal of driver's licence, fines processing, driving test scheduling and utilities payment. These applications were expected to be made available to the public in May 2001. Under the EP project, the traditional procurement system of the Government was automated to realize cost savings and faster turnaround times. Phase I of the system, which went live on a pilot basis on 6 October 2000, would benefit about 20,000 large and small suppliers when fully rolled out. Under the GOE, a generic set of ICT tools was developed such as document management, messaging system, electronic meeting and decision tracking, which would assist the functioning of core processes, thus facilitating day-to-day operations and management of government offices. The system, scheduled to go live in April 2001, would not only increase the ICT awareness among government personnel but also improve their efficiency and effectiveness. The HRMIS project would enable about 950,000 government personnel to perform human resource management functions in an integrated environment through a single window interface. Employee productivity, motivation and satisfaction would be enhanced with the availability of better equipment and facilities and automation of work processes. By the middle of 2002, Phase I of the project would be rolled out to benefit 150,000 users in the 10 pilot agencies identified. Meanwhile, PMS trial runs were conducted for the application of projects under the Eighth Malaysia Plan. The ELX aimed to be a one-stop centre for labour market information accessible to the public, both locally and overseas. The objectives were to improve the mobilization of the nation's human resources and to ensure that manpower utilization was optimized through the systematic matching of job seekers to job vacancies. The project was targeted to become fully operational by November 2001.

13.21 The *smart schools* initiative was introduced with the objective of producing a new generation of Malaysians who will be ICT literate, creative as well as innovative and capable of leading the economy into the Information Age. The

project, which was implemented on a pilot basis during the Seventh Plan, involved a total of 90 schools comprising the construction of nine new schools and the upgrading of 81 existing schools. These schools were equipped with state-of-the-art multimedia/computing equipment and provided with comprehensive teaching-learning materials for four subjects, namely, *bahasa Malaysia*, English, science and mathematics. These materials not only enhanced the network-based curricula but also enabled students with varying capabilities to progress at their own pace. The Smart School Management System enabled school administrators to efficiently and effectively manage resources and processes required to support the teaching and learning functions of these schools. As a complement to the smart schools, the Global Schools Network was also initiated to network Malaysian schools with selected schools around the globe.

13.22 The *multi purpose card* flagship application was introduced to improve the ease with which Malaysians conducted routine transactions with the Government and private companies. Two major initiatives were carried out, namely, the Payment Multi Purpose Card (PMPC) and the Government Multi Purpose Card (GMPC). A series of milestones were achieved. The e-cash, a key application in both cards, completed its technical pilot during the Kuala Lumpur '98 - XVI Commonwealth Games, followed by the e-cash commercial pilot launched in September 1999.

13.23 With regard to GMPC, field tests were carried out with selected users. It was targeted that a total of two million smart cards would be issued to citizens in the MSC and Klang Valley in 2001. The card provided a secure medium for storing key personal identification information, which included data on identity card, driving licence and immigration entry/exit records. Health information was also to be stored on the card to allow medical practitioners instant access to basic and critical medical information that would aid diagnosis and care in emergencies. The GMPC became a test-bed for the creation of new leading-edge technologies by local companies, many in collaboration with other world-class corporations. To facilitate e-business through enhanced security, a new application, the Public Key Infrastructure (PKI), was included in the GMPC.

13.24 The *Telehealth* application was aimed at accelerating the achievement of Malaysia's health care vision towards creating a nation of healthy individuals, families and communities. During the Plan period, telehealth was implemented at 42 health centres and 41 other teleconsultation sites, many of which were

located in the rural areas. The implementation of the telehealth project started in August 2000 and by the end of the year, one of its projects, Teleconsultation, had completed installation at all sites. The three other projects, namely, Mass Customized/Personalized Health Information and Education (MCPHIE), Continuing Medical Education (CME), and Lifetime Health Plan (LHP) completed their respective Phase I. MCPHIE and CME were nationwide in scope while LHP covered sites such as Hospital Kuala Lumpur, Hospital Kajang, Hospital Ipoh, Hospital Seremban and selected health centres nationwide. The telehealth flagship application was not just a point-to-point consultation but incorporated the full spectrum of multimedia technologies to bring benefits to all players in the health sector.

13.25 The *R&D cluster* was designed to create a cluster of collaborating multimedia R&D centres and firms to produce leading-edge products and technologies while at the same time encouraging local high-tech start-ups and increasing local R&D activities to improve Malaysia's competitiveness. To catalyze these activities, the Government implemented several projects, which included the setting up of the MSC Research and Development Grant Scheme (MGS) in October 1997 and the MSC Student Attachment Programme in 2000.

13.26 Under the MGS, the Government provided an allocation of RM100 million during the Plan period. The aim of the scheme was to enhance technological capabilities of Malaysian MSC-status companies, particularly SMEs, through R&D. Since its launch, a total of 19 projects with a value of RM38 million was approved. The projects included a range of multimedia products and services such as computer telephony integration, interactive hearing aids for the hearing impaired and the transaction information management engine. The Student Attachment Programme was undertaken to provide industry relevant experience to students pursuing ICT-related courses. By working on areas identified by the industry, the students were able to relate coursework to on-the-job technical applications. The firms also benefited from having personnel working on specific problems and addressing their short-term needs. By the end of the Plan period, 51 students were involved in this programme.

13.27 The latest initiative developed under the MSC was the Entertainment Village (E-Village), aimed at becoming a regional centre for content development. Apart from providing world-class physical infrastructure for creative multimedia innovations by local and international investors, E-Village was also targeted to catalyze the development of local content in the entertainment industry.

Development of Communications Infrastructure

13.28 During the Plan period, substantial investments were made in laying the communications infrastructure comprising fibre optics, satellite and cellular technology to support the development of ICT in the country. An extensive fibre optic network was installed covering 62,600 kilometres linking states and major towns across the country by the end of 2000. The fibre optic network enabled high capacity broadband transmission capable of carrying different types of traffic such as data, voice and video. With regard to satellite technology, Malaysia had four satellite gateways, namely, at Kuantan, Labuan, Melaka and Sematan, which provided connections to countries around the Indian and Pacific Oceans. Despite these investments, the penetration rates were still low. The national average for fixed line penetration was only 23.2 per cent while in the rural areas, the penetration rate was 11.7 per cent.

13.29 For the MSC, a fibre optic backbone network covering 360 kilometres was completed during the Plan period. The backbone also involved the installation of Asynchronous Transfer Mode (ATM) switches at Cyberjaya, Wilayah Persekutuan Putrajaya and Bukit Jalil to support broadband multimedia applications and high speed Internet access. The MSC broadband infrastructure consisted of four major rings, each ring having a bandwidth of 2.5 gigabits per second (Gbps) scalable to 10 Gbps. To ensure the high quality of the infrastructure provided, a performance guarantee with financial rebates was introduced in 1999.

13.30 Internet and wireless technologies represented two of the fastest developing technologies in the telecommunications field. By the end of the Plan period, six ISPs were granted licences but only three had started to provide Internet access to their subscribers. To complement ISPs, Access Service Providers (ASPs) were also licensed. As at the end of 2000, there were 43 ASPs in the country, mainly in the Klang Valley and Pulau Pinang. With the advancement of wireless technology, new types of affordable access devices were made available to access the Internet. These included the Wireless Application Protocol (WAP) devices such as mobile phones, hand-held devices and set-top boxes.

Electronic Commerce

13.31 The rapid growth of the Internet as a consumer technology led to the accelerated use of electronic commerce (e-commerce) globally as well as nationally. The e-commerce market was estimated to have increased from USD1 billion in

1998 to USD6 billion in 2000 in the Asia Pacific region. E-commerce not only affected business and individual consumers, but it also reshaped market places, trading relationships and even international trading boundaries. E-commerce presented opportunities for businesses to improve competitiveness, have a global presence, undertake customization and create novel businesses. At the same time, there were concerns with regard to the global and borderless nature of e-commerce as well as consumer protection and confidence from cybercrimes. In view of the potentials and concerns on e-commerce, a National Electronic Commerce Committee was set up to formulate a framework aimed at promoting and coordinating the development of e-commerce.

13.32 To establish a comprehensive and robust framework on e-commerce, a study on Electronic Commerce Strategic Directions for Malaysia was undertaken. The study, which was completed in February 2000, underlined the importance of having a critical mass, building trust to conduct business on the web, attracting inbound customers, transforming organizations as well as enhancing policy and regulatory framework. Specific initiatives were recommended and these included On-line Trading Post, Integrated Logistics Hub, Encryption Technology Development, Intellectual Property Management System and Internet Exchange. The implementation of these initiatives was aimed at positioning Malaysia as an e-commerce hub in the global market space.

13.33 During the Plan period, several private sector initiatives were implemented to benefit from the rapid growth of e-commerce. Local companies started doing business on-line through e-commerce-enabled websites. These companies covered various industries such as retail entertainment, software, travel and auctions. Examples of e-commerce businesses included Mall of Malaysia, Asia Travel Mart, Lelong.Com and Cyber Music Asia.

13.34 In order to support the development of e-commerce, *Bank Negara Malaysia* designated Malaysian Electronic Payment Systems (MEPS) to build and operate an on-line payment gateway between consumers and merchants for on-line transactions over the Internet. MEPS, owned by 27 local financial institutions, uses the Secured Electronic Transaction (SET) protocol as the standard for payment. MEPS also enabled transactions to be conducted using the Secure Sockets Layer (SSL) protocol. In addition, MEPS runs the Nationwide Payment and Clearing System (NPCS), Electronic Purse Smart Card (MEPS CASH), Payment Multi Purpose Card (PMPC) and Inter Bank Giro (IBG).

13.35 As part of the effort to promote and encourage e-commerce, various laws and regulations were enacted to regulate activities in cyberspace. The Digital Signature Act 1997 provided an avenue for secure on-line transactions through the use of digital signatures. Under this Act, the Controller of Certification Authority was appointed on 1 October 1998 to monitor and license recognized Certification Authorities. By the end of 2000, two companies were authorized to verify transactions through providing digital certificates, namely, Digicert Sdn. Bhd. and MSC Trustgate Sdn. Bhd. The Copyright (Amendment) Act 1997 aimed at ensuring adequate protection of intellectual property rights for companies investing in the ICT and multimedia environment. Other acts included the Computer Crimes Act 1997 to provide for offences relating to the misuse of computers; the Telemedicine Act 1997 to provide a framework for licensed medical practitioners to provide telemedical services; and the Communications and Multimedia Act 1998 to provide a regulatory framework to cater for the convergence of the telecommunications, broadcasting and computing industries.

Human Resource Development for ICT

13.36 The ongoing revolution in ICT led to changes taking place in the composition of employment and in the labour market. The demand for ICT workers comprising hardware engineers, software engineers, systems analysts, computer programmers and technical support personnel increased from 88,160 in 1998 to 108,200 in 2000. This represented a rapid growth of 10.7 per cent per annum compared with the overall employment growth of 3.7 per cent during the same period. The technical support personnel and systems analysts were the two largest groups, representing 32.1 per cent and 23.7 per cent, respectively. On the supply side, it was estimated that about 20,260 students graduated from public and private institutions in ICT and related engineering courses in 1999. Of the total number of graduates, almost 71 per cent were from private institutions, indicating the important role of the private sector in ICT training. There were 170 private institutions and 28 public institutions offering ICT courses as at October 1999. While private institutions offered courses mainly at the diploma and bachelor degree levels, the public institutions mainly focused on the bachelor and post-graduate levels.

13.37 As part of the effort to meet the rising demand for ICT workers, particularly in the MSC area, the Multimedia University (MMU) was established in 1998 with two campuses, one each in Cyberjaya and Melaka. Equipped with high speed ATMs, multimedia learning facilities and digital libraries, MMU offered a spectrum of ICT and multimedia-based courses at the undergraduate

and post-graduate levels. By the end of 2000, about 9,000 students were enrolled in these courses. Of this total, about 22 per cent were ICT bachelor degree undergraduates. To meet the needs of the MSC, the Government successfully undertook a number of initiatives to adequately meet the demand for knowledge workers. These included measures introduced to increase the number of institutions of higher learning. This was accelerated by the awarding of MSC status to institutions of higher learning or their faculties that focused on training of knowledge workers in priority areas such as ICT, engineering and management.

13.38 With the anticipated rapid growth in e-commerce, many public and private institutions offered business studies courses with e-commerce content. The number of students enrolled in these courses were 6,075 in 1999 in both public and private institutions, mainly at the bachelor degree level. The number of business graduates with e-commerce training were 1,398 in 1999.

13.39 ICT-based training was also given emphasis among the working population to upgrade their ICT knowledge and skills. Under the Human Resource Development Fund (HRDF), RM101.6 million or 14.7 per cent were disbursed for ICT-based courses during the Seventh Plan period. This involved the financing of 296,800 training places.

Funding for ICT Industry

13.40 Access to venture capital is regarded as a prerequisite to develop enterprises based on innovative ideas and good business models. However, there was a lack of such capital, especially for the early stages of business development due to the reluctance of the traditional banking system to provide financing for these high-risk ventures as well as the lack of expertise to undertake a proper assessment of the project proposals. In view of these concerns, the Government established a RM500 million ICT Fund in 2000 to provide financing to high-technology and ICT-based firms. Of this amount, RM200 million was channelled through *Bank Industri dan Teknologi Malaysia Berhad* (BITMB) to provide financing to high-tech industries including advanced electronics, ICT, biotechnology and advanced manufacturing. Another RM300 million was channelled through commercial banks to provide venture capital financing for these industries. By the end of 2000, a total of 46 loan applications amounting to RM211.1 million was received by BITMB while the amount of loans approved was RM27.3 million.

13.41 To catalyze the growth of venture capital companies and draw their interest into the ICT sector, the MSC Venture Corporation (MSC VC) was set

up in 1999 as a wholly-owned subsidiary of the MDC. The MSC VC assisted MSC-status and potential MSC-status companies, particularly the SMEs to obtain venture capital funding. The MSC VC launched its first fund, the MSC Venture One, in June 1999 amounting to RM120 million. The fund targeted companies either at start-up, growth or pre-initial public offer (IPO) stages of development. By the end of 2000, MSC VC committed investments in 10 companies amounting to RM43 million.

13.42 During the Plan period, the Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ) was established to provide an alternative avenue of fund raising for technology and high-growth companies without a track record as well as start-up companies. Focus was given to 12 priority technology areas such as advanced electronics, ICT, telecommunications, biotechnology and aerospace. To promote foreign investments in MESDAQ, expatriation of funds was exempted from foreign exchange control rules. Efforts were also taken to improve the trading system with the introduction of a new Internet-based system and work was initiated for a link-up with the Kuala Lumpur Stock Exchange (KLSE). Since the commencement of trading in April 1999, three technology-based companies related to pharmaceuticals, ICT and multimedia were listed.

III. PROSPECTS, 2001-2005

13.43 Malaysia is well placed to benefit from the new wave of growth based on the ICT revolution. The relatively developed infrastructure and the conducive environment put in place during the Seventh Plan period for the development of ICT, particularly within the MSC, have formed the foundation for Malaysia to leverage on the growth opportunities provided by the ICT. During the Eighth Plan period, focus will be given towards further strengthening the human resource capabilities, hard and soft infrastructure as well as the building of a critical mass of SMEs and Internet users to enable Malaysia to move rapidly towards becoming a developed nation with a knowledge-based society. Towards this end, the strategic thrusts for the development of ICT will include:

- ❏ *positioning Malaysia as a major global ICT and multimedia hub;*
- ❏ *upgrading and expanding the communications infrastructure to increase accessibility throughout the country as a means of bridging the digital divide;*

- ❑ *enhancing human resource development in ICT to increase the supply of highly skilled and knowledge manpower;*

- ❑ *promoting e-commerce and enhancing its use to enable Malaysia to compete more effectively in the global market;*

- ❑ *fostering local capabilities in creative content development;*

- ❑ *rolling out the MSC flagship applications to further provide the momentum for the development of the MSC;*

- ❑ *nurturing a critical mass of ICT-based SMEs; and*

- ❑ *promoting R&D activities on soft factors of ICT and Information Age developments that affect individuals, organizations and societies.*

Positioning Malaysia as a Global ICT and Multimedia Hub

13.44 Significant progress has already been made in fostering the development of ICT and multimedia. During the Eighth Plan, concerted efforts will be made to further enhance the development of the sector and position Malaysia as a major global ICT and multimedia hub. Focus will be made towards achieving world-class performance, in terms of service availability, affordability and productivity. In this regard, companies will be encouraged to constantly benchmark against the highest performing countries in the region and globally. To facilitate Malaysian companies to compete globally, ICT will be used as a key enabler, especially in critical sectors such as banking and finance, logistics, manufacturing and key services. The competitive and advanced ICT infostructure in the MSC will also catalyze the growth of high value enterprises in the biotechnology, bio-informatics and design sectors.

13.45 As part of the effort to move towards world-class performance, the Government will implement a new policy framework for the ICT and multimedia sector that is based on rapid transition to full competition. The pro-competition framework will be the main driver of performance in terms of infrastructure roll-out, service quality and innovation, and competitive pricing. Initial steps have already been made towards creating this competitive framework with the enactment of the Communications and Multimedia Act 1998, which strongly endorses competition as a means of achieving high performance.

13.46 Among the additional measures that will be undertaken to ease market entry to create a competitive environment will be the implementation of a clear, simple and practical licensing regime and minimizing licensing requirements for new services such as ISP and Voice over Internet Protocol (VoIP). To ensure fair competition, the Government will undertake to remove user tariff controls, open up key bottleneck infrastructure elements such as local loop and transmission towers, and enforce fair interconnect rates and practices. To ensure Malaysia's continued competitiveness in the ICT industry, a research centre will be established, which will conduct studies, keep continuous tabs on the dynamics of the global ICT industry, assist the industry in benchmarking and also provide advice to the Government on policy planning in the ICT industry. The Government will also seek a leadership position for Malaysia in international fora to further the global hub agenda.

Upgrading and Expanding ICT Infrastructure

13.47 During the Plan period, investments will be made to upgrade communications network in line with technological advancements. The capacity of the transmission backbone connecting North, Central, East and South of Peninsular Malaysia and with Sabah and Sarawak will be upgraded to 10 Gbps using the Wavelength Division Multiplexing (WDM) technology. This will enable the transmission of high speed, broadband multimedia applications over long distances. For the Customer Access Network (CAN) or the local loop that connects residential and business customers to the local exchange, the current copper cables will be upgraded using the Asymmetric Digital Subscriber Line (ADSL) technology to support multimedia applications. Other initiatives that will be implemented during the Plan period will be the introduction of the Network Management System in CAN to ensure better service availability and the launching of *Telekom Malaysia* Internet Service Exchange (EastGate) in Cyberjaya. There will also be a migration to third generation (3G) mobile communications technology, which will provide mobile Internet to consumers, thus further enhancing Internet-based services such as e-commerce. Apart from the provision of infrastructure, efforts will also be made towards providing broadband access on flat rate bandwidth-based charges that are affordable. Such a pricing mechanism will promote Internet usage and also uptake of Internet-based applications among the people.

13.48 ICT infrastructure will continue to be extended to the rural areas as part of the effort to narrow the digital divide between the urban and rural areas, and consequently, achieving a balanced development in the country. To ensure an equitable distribution and access to ICT, the Universal Service Provision Programme that is based on three basic principles of availability, accessibility and affordability will be implemented. Under this Programme, a Universal Service Provision Fund will be set up with contributions from telecommunications service providers. The Fund, which will be operational in 2001, will be used to subsidize the provision of telecommunications infrastructure in the rural areas. It is anticipated that this Programme will increase the telephone penetration rate in the rural areas from 11.7 telephones per 100 population in 2000 to 17.5 telephones per 100 population in 2005.

13.49 With a view to further accelerating the use of ICT in the rural areas, the Government will implement the *Infodesa* programme. Under this programme, eight *Infodesa* centres will be established on a pilot basis. These centres will provide ICT training to the local communities, develop content applications as well as become one-stop centres for information on government services. The centres can also be utilized for teleworking and distance learning. The *Internet Desa* programme, which was launched in 2000, will be expanded to cover 100 locations. The centres will continue to be located at post offices and will offer awareness and training courses to the users.

13.50 Recognizing that significant access and equity gaps exist and that a substantial number of Malaysians will be at risk of being marginalized by the ICT revolution, a comprehensive and integrated policy as well as a framework for action to address the problem of the digital divide will be formulated during the Eighth Plan period. The policy will cover four important aspects, namely, ICT infrastructure plan for universal access, local content development, equitable access to affordable ICT products and services, and access to lifelong learning opportunities.

Enhancing Human Resource Development in ICT

13.51 As ICT becomes increasingly ubiquitous, the demand for ICT workers will grow rapidly, both to enable the use of existing technologies as well as to develop such technologies for the future. It is projected that the demand for workers in core ICT occupations such as hardware engineers, software engineers, systems analysts, computer programmers and technical support personnel will increase from 108,000 in 2000 to 181,600 in 2005. As reported in the Study on the Manpower Requirements to Support the Application and Diffusion of ICT

in Malaysia, the most required technical skills will be Local Area Network (LAN) administration, PC technical support, PC programming and client server computing.

13.52 To meet the increasing demand for ICT workers, efforts will be made to improve and expand ICT education. At the school level, about 8,000 primary and secondary schools will be provided with computer facilities by the end of the Plan period while computer-aided teaching and learning will be intensified with the development of software for the various subjects. Internet access will also be made available to schools and for those in the rural areas where conventional means of access may be a problem, access will be provided by satellite communication, especially the VSAT technology. The objective is to increase computer literacy among students as well as expose them to the benefits of the Internet, particularly those in the rural areas. More ICT and related engineering courses will also be introduced by both the public and private institutions of higher learning. A total of 122,910 students will be enrolled in these institutions by 2004, mainly at the diploma and bachelor degree levels. The private sector's involvement in the provision of ICT education will continue to be significant as 71 per cent of the total enrolment is from private institutions.

13.53 ICT training will continue to be given emphasis as the pace of technological change in ICT will necessitate ongoing training for the ICT workforce. Firms will be encouraged to send their workers for training to keep their skills up-to-date, thereby increasing their output and productivity. To facilitate this, the Government will provide tax incentives to reduce the cost of training to firms. The HRDF will also continue to provide disbursements for ICT-based training. In addition, new apprenticeship schemes in areas related to ICT will be introduced.

13.54 The negative influences of the Internet, such as misreporting and abuse of knowledge, can pose a security threat to the nation. To counter such influences, a code of ethics in the conduct of activities over the Internet will be inculcated beginning at the school level.

Promoting Electronic Commerce

13.55 With the ongoing innovations in ICT and the rapid growth of the Internet, the development of e-commerce will accelerate during the Eighth Plan period. As the initial foundation for e-commerce is already in place in terms of the enabling environment and infrastructure development, special focus will be

given towards promoting and encouraging the wider use of e-commerce as a new way of doing business through the digital network.

13.56 The greater adoption of e-commerce calls for a cohesive partnership between the Government, business and community. On the part of the Government, efforts will continue to be made to create a stable and supportive environment for the conduct of commerce and trade electronically. More attention will be directed towards the effective enforcement of the various laws and institutional mechanisms established. The Government will also undertake measures to build trust and confidence in e-commerce including security and privacy for consumers. In this regard, a law on personal data protection will be introduced to address privacy concerns. Infrastructure and logistical support, which encompass networks, payment systems and logistics will also be provided to enhance the development of e-commerce. In addition, the Government will carry out a detailed feasibility study and subsequent implementation programmes of the proposals identified under the study on Electronic Commerce Strategic Directions for Malaysia. E-commerce applications will be widely used to enhance organizational transformation in both the public and private sectors.

13.57 While the Government undertakes a key role in catalyzing the ideal environment for e-commerce to flourish, businesses and communities will have to respond and participate actively in the development and usage of e-commerce. E-commerce will bring substantial benefits to businesses in terms of a reduction in transaction costs, inventories and overheads as well as the time between the outlay of capital and receipts of products and services. For the consumers, the benefits that will be enjoyed include wider choices, quick delivery and the ability to shop anytime and from almost anywhere.

Fostering Local Capabilities in Content Development

13.58 In developing Malaysia into a global ICT and multimedia hub, several initiatives will be undertaken to foster local capabilities in creative content development. Steps will be taken to reduce regulations for television and film content production to enable more market participation. The Content Forum, which was set up with industry players as members, will draft its own code of conduct as a means of self-regulation. At the same time, there will be minimal regulation on the production of on-line content so as not to impede the growth

of the nascent industry. To further support and encourage the development of creative content industry locally, the Government will develop clear and precise rules on intellectual property rights protection. This will be complemented by effective enforcement to combat piracy.

13.59 In addition to the creation of a conducive legal environment for content development, the Government will provide financial assistance to promote the production and distribution of locally created content, especially creative multimedia content based on local culture. In this regard, the establishment of a content development fund will be considered, with mandatory contributions from broadcasters and exhibitors. The fund will be used to partly defray the cost of content creation activities that require significant financial resources. The provision of fiscal incentives will also be considered to stimulate content development locally.

13.60 To further develop the content industry, emphasis will be placed on skills development. The MMU will expand its capacity to produce graduates with specialized knowledge in the fields of multimedia and advanced digital technologies. In addition, a special programme will be formulated to enhance training in software development. Efforts will also be made to encourage the private sector to be involved in the training of such skills to fill the existing skills gaps identified for creative content development. These will be undertaken through the provision of incentives and the promotion of local and foreign collaboration in content production to enable the transfer of knowledge and skills to Malaysians.

13.61 The development of the creative content industry in Malaysia will be enhanced with the implementation of the E-Village initiative. This initiative will act as a catalyst by focusing on the creative supply chain, from content creation to commercialization and, finally, distribution. The state-of-the-art production studios and post-production facilities with the latest cutting-edge technology in animation and audio/visual effects will provide the infrastructure for creative multimedia innovations and R&D. The first of these production studios was launched in September 2000 while the remaining seven will be completed during the Eighth Plan period. Once completed, E-Village will be the regional centre for multimedia and content development. Guiding the direction of the E-Village project will be an international advisory panel comprising local and international practitioners in the creative multimedia industries.

Rolling-out the MSC Flagship Applications

13.62 Based on the experiences of the pilot projects as well as the need to maintain the momentum for the development of the MSC, the first wave flagship applications will be rolled out during the Eighth Plan period. The roll-out will comprise another key strategy in the overall plan to address the problem of the digital divide. The smart school concept will be expanded to cover 8,000 primary and secondary schools while telehealth will be implemented at health care centres as well as rural clinics. The pilot applications being developed during the Seventh Plan will be rolled out after ascertaining their effectiveness. For the E-Services project, more government services will be introduced that will transform it into a single government portal.

13.63 The second wave flagship applications will also be implemented during the Eighth Plan period with focus on attracting leading-edge technology developers into the MSC and promoting the transfer of technology and R&D. Towards this end, a study will be undertaken to identify the deliverables, timelines and milestones for the development of the second wave flagship applications. The study will also look into the constraints identified in current flagship processes and make recommendations for improvements. The second wave flagship applications will also address issues such as cross-flagships integration to improve first wave flagship applications pilot projects prior to roll-out. The development of the second wave flagship applications will be a continuing exercise, taking into account the latest changes in the operating environment.

Nurturing ICT-based SMEs

13.64 The creation of a critical mass of ICT-based SMEs is important for the development of a knowledge-based economy. Towards this end, several initiatives will continue to be undertaken. These include creating Malaysian icons of success to be role models for other SMEs, assisting SMEs in marketing and gaining international marketing access as well as upgrading the MSC central incubator to spawn technopreneurship throughout the economy. Another important element in nurturing these companies will be the provision of financial resources. As SMEs do not have sufficient collateral and, therefore, face difficulties in securing financing from the traditional banking system, 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 courses on risk assessment will be conducted to build up the expertise of those managing the fund. At the same time, efforts will be undertaken to promote the awareness of the ICT fund.

13.65 As e-commerce offers considerable opportunities for SMEs to create value added by producing new products, adopting completely new business practices or changing the ways in which they interact in the market place, efforts will be made to encourage more SMEs to adopt e-commerce applications in their business processes. These initiatives include awareness campaigns on the benefits of e-commerce, training courses and workshops to familiarize SMEs with business applications of the Internet, and award programmes to recognize the achievement of business innovators and reward innovative business practices. The Government will continue to provide matching grants to SMEs to finance e-commerce activities such as web page development and hosting. An allocation of RM5 million will be provided for this purpose during the Eighth Plan period.

Promoting R&D on Soft Factors

13.66 The contemporary information and communication products and services such as radio, television, cellular phones, e-mail, Internet, computers and video conferencing are changing the way individuals, organizations and societies are communicating, interacting, doing business transactions and learning. Recognizing the ubiquity and the nature of emerging Information Age issues and challenges, the Government, in collaboration with the public policy and higher learning institutions, will undertake research on the soft elements of ICT development. These include monitoring and evaluating ICT impact on public, private and household sectors; Internet subscription and usage profile; emerging work culture characterized by the rise of knowledge workers and teleworking modes; measuring knowledge developments and the formation of information and knowledge-based societies through Knowledge Imperative Index (KIX) and Knowledge Economy Model (KEM) initiatives; and realigning trade, industry, product and occupational classifications to define the information sector.

IV. ALLOCATION

13.67 During the Eighth Plan period, a total of RM5.2 billion will be allocated for ICT-related programmes and projects, as shown in *Table 13-4*. Of this amount, RM1.8 billion will be for the first wave flagship applications roll-out while RM1.6 billion will be for the computerization of several ministries and agencies

TABLE 13-4

DEVELOPMENT ALLOCATION FOR ICT-RELATED PROGRAMMES AND PROJECTS, 2001–2005
(RM million)

Programme / Project	*Allocation*	*%*
Flagship Applications	**1,824.9**	***35.4***
E-Government	434.8	
Smart Schools	401.1	
Telehealth	400.0	
Multi Purpose Card	418.1	
R&D Cluster	1.9	
Cross Flagship	169.0	
Computerization	**1,641.8**	***31.8***
Research & Development	**300.0**	***5.8***
Bridging the Digital Divide	**1,098.0**	***21.3***
Infodesa	30.2	
Internet Desa	3.0	
Universal Service Provision	119.8	
Computer Infrastructure for Rural Schools	945.0	
Local Content	**10.0**	***0.2***
Others	**284.4**	***5.5***
Total	**5,159.1**	***100.0***

to further enhance the delivery of services to the public. Another RM1 billion will be spent to reduce the digital divide between the urban and rural areas through programmes such as *Infodesa*, *Internet Desa*, Universal Service Provision and computer infrastructure for rural schools. Other programmes that will be implemented include R&D and the development of content locally.

V. CONCLUSION

13.68 Malaysia has made significant strides in increasing the information and knowledge content in all economic activities. In developing further the knowledge-based economy, Malaysia will leverage on the knowledge accumulated from the implementation of the MSC since 1996. Efforts will be intensified in the provision of access, particularly of the rural population, to the necessary infrastructure and

infostructure. This will enable all Malaysians to take advantage of advances in ICT to improve efficiency and productivity, thus contributing to the increased overall competitiveness of the economy. Additional measures will also be undertaken to enhance human resource development to provide adequate skilled and knowledge manpower to support the knowledge-based economy.