

# **MULTIMEDIA MALAYSIA: INTERNET CASE STUDY**



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The report may not necessarily reflect the opinions of the ITU, its members or the government of Malaysia.

The title refers to the prevalent use of the word multimedia in Malaysia to refer to Information and Communication Technology. A noun defined as 'using, involving or encompassing several media' (Merriam Webster's Collegiate Dictionary) multimedia was coined in 1962, one year before the formation of present day Malaysia.

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### 1. Country background

#### 1.1 Strategically placed

Malaysia, around 330'000 square kilometres in size, is located in South East Asia. It consists of two geographical regions, separated by the South China Sea. Peninsula Malaysia is located between Thailand to the north and Singapore to the south. East Malaysia, comprising the states of Sabah and Sarawak, is located on the northern part of the island of Borneo. Sabah and Sarawak are bordered by Indonesia to the south while the Sultanate of Brunei lies between them. Peninsula Malaysia, Sabah and Sarawak have coastal plains and mountainous territory in the interior. Malaysia's location along the Strait of Malacca and on the South China Sea places it strategically in the heart of South East Asia. Administratively, the country is divided into 13 states plus the federal territories of Kuala Lumpur,

Putrajaya and Labuan. It is further subdivided into 136 districts.

#### 1.2 Multi-ethnic and young

Malaysia carried out its fourth post-independence census in July 2000 when the country's population was estimated at 23.3 million, with an annual growth rate of 2.6 per cent (between 1991-2000) and a population density of about 70 inhabitants per square kilometre.<sup>1</sup> One third of Malaysians are under the age of 15 while just four per cent are over 65; the median age is 24 years. The capital of Malaysia is Kuala Lumpur, which in 2000 had 1.4 million inhabitants.<sup>2</sup> About 62 per cent of the population resides in urban areas. The country counted 5.4 million households in 2000 (of which 4.9 million consisted of citizen households) with an average ratio of 4.3 people per home.

Figure 1.1: Map of Malaysia



Source: World Factbook.

**Table 1.1: Population indicators**

Item	Year 2000
Total population (million)	23.26
Urban population (%)	62
Population Density (Per/ km <sup>2</sup> )	70
<b>Age Distribution:</b>	
Below 15 years (%)	34
15-65 years (%)	62
65 years and older (%)	4

Source: Department of Statistics.

Malaysia is a multi-ethnic nation with citizens consisting of Malay (60 per cent), Chinese (26 per cent), Indians (8 per cent) and various indigenous groups, such as the Iban in Sarawak, the Kadazan Dusun in Sabah and the Orang Asli on the Peninsula. Non-citizens comprise almost six per cent of the population. The official religion is Islam and about 60 per cent of the population is Muslim. Some 19 per cent are Buddhist, nine per cent Christian and six per cent Hindu. Malaysia's official language is Bahasa Melayu with Chinese, Tamil and indigenous languages used amongst their respective ethnic groups.<sup>3</sup> English is also widely spoken and Malaysia is a member of The Commonwealth.

### 1.3 Weathering the storm

Malaysia's economy has been one of the most robust in South East Asia. Its transformation from mining and agriculture in the 1970s to manufacturing in the 1990s, allowed the country to attract foreign investment and substantially increase its exports. Until 1997, the country experienced over three decades of rapid economic development with an average annual GDP growth of 7.6 per cent between 1989 and 1999.

The Asian financial crisis threw Malaysia into recession in 1998. Its currency, the Malaysian Ringgit (RM), depreciated by almost 40 per cent and economic growth fell by over seven per cent. The government's response was prompt. It announced a range of objectives to stimulate the economy,

such as stabilizing the currency and fostering domestic demand. Since 1999, Malaysia has experienced one of the strongest recoveries within the Asian region. GDP growth was 6.1 per cent in 1999 and 8.3 per cent in 2000.

With a 2000 Gross National Income per capita of US\$ 3'370, Malaysia is classified

as an Upper middle-income country by the World Bank. GDP was US\$ 90 billion, consisting of 9 per cent agriculture, 45 per cent industry (of which 28 per cent manufacturing) and 46 per cent services. Malaysia is the world's largest exporter of semiconductors and electrical and electronic products make up over 50 per cent of total exports. The country plans to attain the status of a developed nation by 2020 (see Box 1.1).

### 1.4 Quality of life

According to the United Nations Development Programme (UNDP), Malaysia ranks 56th out of 162 countries in the Human Development Index (HDI), which places the country within the top quarter of the medium human development group. The HDI is a composite of indicators including life expectancy, literacy, school enrolment and per capita GDP. Table 1.2 shows that Malaysia ranks high compared to other countries in South East Asia. In relation to countries of similar per capita income, Malaysia's human development is not as high as Latin American and Eastern European nations but outperforms Middle Eastern and African nations.

In 1999, the Prime Minister's Office published the Malaysian Quality of Life Report, a comprehensive study on socio-economic development in the country between 1980-1998.<sup>4</sup> Similar to the HDI, the Malaysian Quality of Life Index (MQLI) goes beyond purely economic aspects. The index is a

**Table 1.2: Human Development Index**

Malaysia compared to other South East Asia countries (center table) and Malaysia compared to countries with similar GDP per capita (right table)

Indicator	1999	Nation	HDI	Nation	GDP per capita (PPP US\$)	HDI
Life expectancy (years)	72.2	Singapore	26	Poland	8'450	38
		<b>Malaysia</b>	<b>56</b>	Chile	8'652	39
Adult literacy (%)	87.0	Thailand	66	Mexico	8'297	51
Combined school gross enrolment ratio (%)	66	Philippines	70	<b>Malaysia</b>	<b>8'209</b>	<b>61</b>
		Vietnam	101	Saudi Arabia	10'815	68
GNP per capita (US\$, PPP)	8'209	Indonesia	102	Oman	13'356	71
		Cambodia	121	South Africa	8'908	94

Note: HDI = Human Development Index

Source: UNDP Human Development Report 2001.

composite of 38 indicators across ten areas. In addition to economic progress, the report, which illustrates Malaysia's commitment to "holistic and balanced development" looks at areas such as health, education, environment, social participation and public safety. The MQLI shows an overall improvement of 22 per cent; a decline was noted in only two sectors: the environment and public safety. Malaysia's well-being is confirmed by another survey which found that over seventy per cent of Malaysian's are happy with their current state of life.<sup>5</sup>

### 1.5 Recent history

After the Federation of Malaya (today's Peninsula Malaysia) gained

independence from the United Kingdom on 31 August 1957, it united with Sarawak, Sabah and Singapore to become Malaysia in 1963. Singapore left the union two years later. The multi-ethnic country has generally enjoyed a politically stable environment. When ethnic tensions developed at the end of the 1960s, the government was quick to respond. The introduction of the New Economic Policy, a measure that increased economic growth and reduced disparities, helped to lessen social divergences.

Malaysia is a parliamentary democracy. A constitutional Monarch, picked by rotation every five years from amongst the sultans of nine Peninsula Malaysia states, heads

### Box 1.1: Vision 2020

Malaysia's Vision 2020, issued in 1991, outlines where and why the country wants to go in the future.<sup>6</sup> Vision 2020's timing is significant, at a midway point, almost thirty years after the formation of present-day Malaysia and projecting goals thirty years into the future to the year 2020. First presented by the Prime Minister at a Malaysian Business Council meeting, Vision 2020 is divided into three sections. The title of the first, sums up the main goal, "Malaysia as a Fully Developed

Country" by the year 2020. The Vision lists nine societal goals to pursue on the way: unified, 'psychologically' liberated, democratic, moral and ethical, tolerant, scientific and progressive, caring, economically just and prosperous. Vision 2020 identifies a perspective of the future that factors Malaysia's unique characteristics into being a developed country in its 'own mould.' Vision 2020 is the nation's roadmap as virtually all government strategies and plans are tied back to it.

the nation. The Barisan Nasional (and its predecessor), which comprises a coalition of different political parties representing the diverse ethnic groups in Malaysia, has governed the country since independence. The present Prime

Minister, Datuk Seri Dr. Mahathir Mohammed, has been in office since 1981 winning his fifth term in 1999.

Malaysia was a founding member of the Association of Southeast Asian Nations (ASEAN), created in 1967.

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- <sup>1</sup> Department of Statistics. "Population Distribution and Basic Demographic Characteristics Report. Population and Housing Census 2000." *Press Statement*. 6 November 2001. [www.statistics.gov.my/English/pressdemo.htm](http://www.statistics.gov.my/English/pressdemo.htm).
  - <sup>2</sup> The administrative capital is being transferred to Putrajaya.
  - <sup>3</sup> There are over 100 languages in use. See "Ethnologue: Languages of the World, 14th Edition" at [http://www.ethnologue.com/show\\_country.asp?name=Malaysia](http://www.ethnologue.com/show_country.asp?name=Malaysia).
  - <sup>4</sup> Economic Planning Unit. *Malaysian Quality of Life 1999*. <[www.epu.jpm.my/kualiti/KUALITI.HTML](http://www.epu.jpm.my/kualiti/KUALITI.HTML)>.
  - <sup>5</sup> ACNielsen. "Malaysians Optimistic about Living Conditions."
  - <sup>6</sup> For the full text, see <http://www.smpke.jpm.my/main/vision.htm>.



## 2. Telecom and mass media

### 2.1 Telecommunications

Malaysia's first telephone was installed at the British Resident's office in Perak in 1874.<sup>7</sup> This was followed by the installation of telegraph lines including a submarine cable linking the island of Penang with Perak. The country's first telephone exchange was installed in Kuala Lumpur in 1891. In 1960, Malaysia had just under 50'000 telephone lines with a density of less than one per 100 inhabitants. Forty years later, in January 2001, there were over four million fixed telephone subscribers and a density of 20.

#### 2.1.1 Convergence strikes

The regulatory environment for telecommunications in Malaysia underwent a significant change with the enactment of the Communications and Multimedia Act 1998 (CMA).<sup>8</sup> The Act establishes a regulatory framework in support of national policy objectives for the communications industry. Services regulated under the Act include traditional broadcasting and telecommunications, as well as computer networks, and content carried over those systems. The CMA seeks to provide a common set of regulatory provisions based on generic definitions of communications services. It is therefore suited to a converged environment where the same digital information can be transported over any electronic network.

In an innovative approach to legislation, the CMA contains ten national policy objectives. The Act thus complements the traditional 'shall/shall not' tendency of legislation with a statement of 'why'. The ten national objectives are:

1) To establish Malaysia as a major global centre and hub for

communications and multimedia information and content services;

- 2) To promote a civil society where information-based services will provide the basis of continuing enhancements to quality of work and life;
- 3) To grow and nurture local information resources and cultural representation that facilitate the national identity and global diversity;
- 4) To regulate for the long-term benefit of the end-user;
- 5) To promote a high level of consumer confidence in service delivery from the industry;
- 6) To ensure provision of affordable services over ubiquitous national infrastructure;
- 7) To create a robust applications environment for end users;
- 8) To facilitate the efficient allocation of resources such as skilled labour, capital, knowledge and national assets;
- 9) To promote the development capabilities and skills within Malaysia's convergence industries;
- 10) To ensure information security and network reliability and integrity.

The three underpinnings of the CMA are that it is *pro-competition* (it is the first Malaysian Act to directly address competition), it is *technologically neutral* and it aims to achieve *universal service*. The CMA also aspires to flexibility and contains few definitions and few proscriptions. It

therefore enables ongoing reform without changes to the legislation as the implications of a converged environment emerge and evolve.

Although the CMA addresses competition, it did not necessarily introduce a greater degree of liberalization or competition that already existed in the sector. The market was opened to one additional mobile operator in 1989 and four full service operators in 1995. In terms of infrastructure provision, the situation pretty much remains the same whereas for resellers, the market has been made easier to enter. There is a feeling that the infrastructure market is too crowded for a market of Malaysia's size and that there is wasteful duplication of resources. This is confirmed in Malaysia's World Trade Organization (WTO) telecommunication services commitment that explicitly restricts market entry to acquisition of shares of existing providers. Foreign investors are allowed initial ownership as high as 61 per cent in licensed operators that must revert to 49 per cent after five years. Having said this, it is worth noting that Malaysia opened its market much earlier than most countries in Asia and today has one of the most competitive telecommunication markets of any developing nation.

Two institutions were created to carry out the policy and regulatory objectives of the CMA. The **Ministry of Energy, Communications and Multimedia** (MECM) <[www.ktkm.gov.my](http://www.ktkm.gov.my)> was established on 1 November 1998 as the successor to the Ministry of Energy, Telecommunications and Posts. In addition to the multimedia industry—telecommunications, broadcasting, computing and postal services—the MECM is also responsible for energy (electricity).<sup>9</sup> The MECM serves as the country's Controller of Certification Authorities and is responsible for implementing the Postal Services Act 1991 and the Digital Signature Act 1997.<sup>10</sup>

The **Malaysian Communications and Multimedia Commission**

(MCMC) <[www.cmc.gov.my](http://www.cmc.gov.my)> was established in November 1998 under the framework of the Malaysian Communications and Multimedia Commission Act 1998 to be the industry regulator. The Minister of Energy, Communications and Multimedia appoints MCMC's five commissioners. Independence is assured through checks and balances that enhance transparency and fairness. The MCMC employs just over 140 people and has five regional offices in addition to its headquarters in Kuala Lumpur. It is also worth noting that, on 1<sup>st</sup> November 2001, MCMC was entrusted by the Government to take over the function of regulator and industry promoter of Postal and Digital Signatures from the Postal Department.

With a strong focus on social issues, the MCMC is more a promoter of the communications and multimedia industry than a regulator in the traditional sense. As the industry matures and self-regulation takes hold, the role of the MCMC as promoter, developer and facilitator will become more dominant.<sup>11</sup> In the transition period, the focus of the MCMC is on education in order to change the mind-set of industry and the community as well as other agencies. Pursuance of legal remedies is likely to be a less favoured option in the interim. This relaxed approach is designed to give all parties the time to come to terms with the change, not least of all the MCMC, which has to prepare regulatory processes and procedures that will be respected by all stakeholders.

### 2.1.2 From 31 to 4

In order to achieve technological neutrality, the MCMC has replaced the previous system of specific service-based licenses with four types of generic ones:

- *Network Facilities Provider* (NFP) – infrastructure including satellite earth stations, optic fibre cables, switching equipment, broadcast equipment and mobile communication base stations;

- *Network Services Provider (NSP)* – basic connectivity and bandwidth to support application services, and connect different networks. This includes cellular, broadcasting distribution and mobile satellite services;
- *Application Services Provider (ASP)* – particular functions such as voice, data, content and electronic commerce services. This category includes Internet access, IP Telephony, radio paging and audiotex.
- *Content Application Services (CSP)* – special subset of application services including television and radio broadcast services and Internet content services.

The beauty of this licensing framework is that it not only separates the network from the service, but it also places the emphasis on the activity rather than on the technology. Theoretically, a cable television company could provide voice telephony over its network or a telephone company could provide video retrieval services without having to apply for a new license. In reality, it will take some time before this actual convergence takes place, as there are a number of supplementary laws that currently restrict it. Furthermore, though the idea of splitting infrastructure from services seems attractive, in reality, most major telecommunication firms will acquire all the needed licenses to be vertically integrated and provide a full suite of services. It seems uncertain that they would willingly provide reasonable rates for leasing infrastructure to other service providers. Furthermore, a service that required just one license before, such as mobile communications, could require up to four under the current regime.

The MCMC has also introduced two categories of licenses, individual and class. Individual licenses are for when a high degree of regulatory control is deemed necessary. This is the case of

infrastructure (i.e., NFP) when there may be reasons to limit the number of licenses because of technical constraints (e.g., scarce radio spectrum), to avoid duplication, to protect major investments or for national security considerations. An individual license requires approval by the Minister (based on MCMC recommendation), is valid for five to ten years (or the remaining number of years left on its previous license) and attracts an application fee of RM 10'000. Examples of individual licenses include telephony, mobile cellular and bandwidth (e.g., Internet gateway).

A class license has lighter conditions. It simply requires registration, is valid for one year and costs RM 2'500. Examples of services for class licenses include Internet access and radio paging. Note that these are only for service provision—licensees would need to acquire the infrastructure to provide the service, either by applying for the necessary individual license or leasing it from a licensed provider.

Under the previous licensing regime, there had been 220 licenses granted (of which 180 were actually registered) across 31 categories. Licensees were encouraged to migrate to the new system. 135 licenses agreed to obtain new licenses (it is assumed that the others had gone out of business or were no longer interested in providing service). The status of the number of licenses issued as of December 2001 is shown in Table 2.1.

### 2.1.3 The quintet

Malaysia's telecommunication infrastructure market was opened in 1989 when a second mobile operator, Celcom, launched service. From 1993 to 1995, the market was further opened when three additional companies were granted various operating licenses (e.g., fixed, long distance, mobile cellular) allowing them to compete as full service operators. Today, five companies make up the major telecommunication market segment. The companies

**Table 2.1: Industry licenses**

Licenses issued by MCMC, as at December 2001

Category	Number of licenses	Example
NFP	18	Earth Stations, Fixed Links and Cables, Radio Communications Transmitters and Links, Satellite Hubs, Towers, Poles, Ducts and Pits used in conjunction with other network facilities, Public Payphone Facilities
NSP	17	Bandwith Services, Broadcasting Distribution Services, Cellular Mobile Services, Customer Access Services, Mobile Satellite Services
ASP	29	Individual—IP Telephony
	38	Class—Directory services, Messaging services, Internet access services, Audiotex hosting services, Private payphone services, Telegram services
CASP	19	Terrestrial Free to Air TV, Terrestrial Radio Broadcasting, Subscription Broadcasting

*Note:* There is some duplication as licenses have been awarded to subsidiaries of the same holding company.  
*Source:* ITU adapted from MCMC.

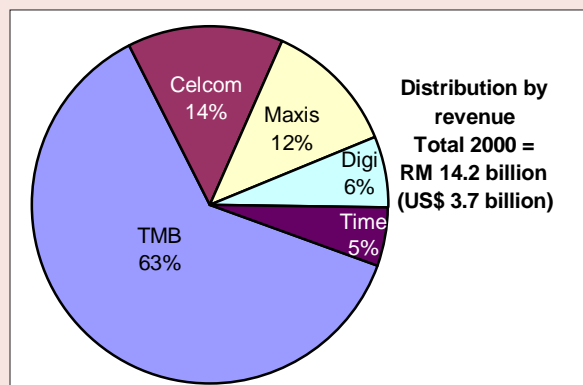
represent a mix of local and foreign owners, of public and private holdings and of ongoing consolidation and mergers (see Figure 2.2).

The incumbent telecommunication operator is **Telekom Malaysia Berhad (TMB)** <[www.telekom.com.my](http://www.telekom.com.my)>. TMB's predecessor organization was Jabatan Telekom Malaysia (JTM, Telecommunications Department) that began operations in April 1946. In 1987, telecommunication services were transferred from JTM to TMB.<sup>12</sup> The decision was made to sell part of TMB in line with the government's privatization policy. Indeed, TMB was the first public organization slated for privatization. TMB was partly privatized when 24 per cent of its shares were sold on the Kuala Lumpur Stock Exchange (KLSE) for RM 2.4 billion (US\$ 871 million) in November 1990.<sup>13</sup> A so-called Special Rights Redeemable Preference Share, owned by the Ministry of Finance, ensures that TMB's operations are consistent with government policy. Any major changes to TMB's activities require the approval of the special shareholder. TMB is involved in every facet of telecommunications including fixed lines, long distance telephone

service, mobile cellular and Internet access.

**Celcom** (Malaysia) Sdn. Berhad <[www.celcom.com.my](http://www.celcom.com.my)> became Malaysia's second telecommunication operator in 1989 when it launched an analogue mobile cellular network. Celcom later launched a digital mobile network and entered the fixed line

**Figure 2.1: Malaysia's telecom market**



*Note:* Maxis has been estimated.  
*Source:* ITU adapted from company reports.

business. Technology Resources Industries (TRI) owns Celcom, which is in turn 21 per cent owned by Deutsche Telekom (Germany) through its DeTeAsia holding company. The remainder of TRI's shares are publicly traded on the KLSE.

**Maxis** Communications Berhad <[www.maxis.com.my](http://www.maxis.com.my)>, formerly Binariang, launched its GSM network in 1993, later to be followed by other services. In July 1998, BT (UK) purchased 33 per cent of Binariang from existing shareholders Usaha Tegas (controlled by Ananda Krishnan, one of Malaysia's wealthiest individuals) and MediaOne (a US company later purchased by AT&T). This left the ownership structure as Usaha Tegas (49.1 per cent), MediaOne (12.6 per cent) and Permodalan Nasional Board, a Malaysian government investment fund, five per cent. In December 2001, Usaha Tegas purchased the BT and MediaOne shares. Maxis is Malaysia's only privately held telecommunication operator though there has been speculation that an International Public Offering may take place. Maxis is linked to two broadcasting entities—Binariang Satellite and the ASTRO Direct-to-Home satellite television

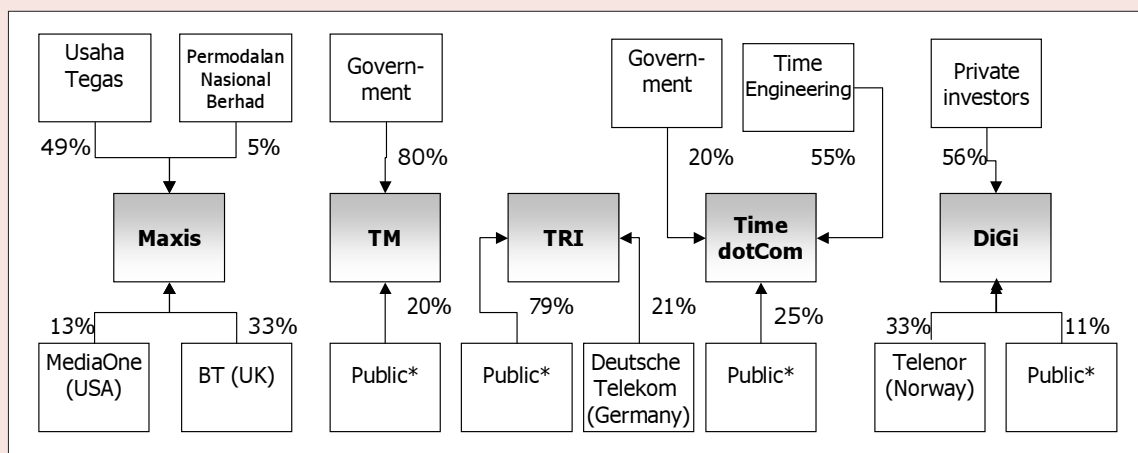
service—by virtue of Usaha Tegas part-ownership of these companies.

**DiGi** Telecommunications Sdn Bhd <[www.digi.com.my](http://www.digi.com.my)> was founded in September 1994 as Mutiara Telecommunications. It launched GSM 1800 services on 24 May 1995, the first GSM 1800 network in Malaysia. In July 1996, Swisscom purchased part of the shares and the name of the company was changed to DiGi Swisscom. It was listed on KLSE in December 1997. Swisscom divested its ownership in 1999. In January 2000, one of DiGi's main shareholders sold 30 per cent of the company to Telenor, Norway's incumbent telecommunication operator. Telenor bought an additional three per cent in June 2000. The remaining shares are held publicly (11.1 per cent, traded on the KLSE) and by private investors (56 per cent).

**TIME** dotCom Bhd <[www.time.com.my](http://www.time.com.my)> started out as an infrastructure provider by building a nationwide fibre optic network. On 8 August 1995, a company called Sapura Telecommunications Sdn Bhd launched a GSM 1800 network known as ADAM. In 1997, TIME purchased 75 per cent equity interest from Sapura and in

Figure 2.2: Ownership of Malaysian telecom operators

December 2000



Note: \* Traded on the Kuala Lumpur Stock Exchange.  
Source: ITU.

August 2000, the brand name was changed to TIMECel to reflect the consolidation of telecommunications activities within TIME dotCom companies.

### 2.1.4 Fixed domination

Though five operators have licenses allowing them to compete in the fixed line market, TMB dominates, a heritage from its incumbency. At the end of 2000, TMB owned 4.574 million of Malaysia's 4.628 million fixed telephone lines in service, accounting for 99 per cent of the market. Because TMB already has local lines going to most of the nation's easy to reach households, new competitors have focused on business users.

Fixed line growth has slowed over the last few years. This is a combination of the after effects of the Asian financial crisis, market saturation and switch to mobile.

### 2.1.5 Too many backbones?

The main operating companies have different degrees of nationwide connectivity for stringing their networks together. Celcom, Digi and Maxis have varying levels of coverage using microwave, fibre optic and in the case of Maxis, satellite links to provide national transmission. TMB, Time and Fiberail operate larger networks, including widespread fibre optic cable use.

TMB's network is the oldest, build up over many years. It uses a variety of transmission networks to provide nationwide connectivity. These include microwave, satellite and fibre optic connections.

Time has over 3'600 kilometres of fibre-optic cable connecting major cities in Peninsula Malaysia. This includes its concession for laying fibre optic along the North-South expressway running the length of the peninsula. Time has also laid over 1'600 kilometres of submarine festoon fibre cable with 25 landing points around Peninsula Malaysia.

The nation's railways are also being used to create a fibre-optic network. **Fiberail Sdn Bhd** <[www.fiberail.com.my](http://www.fiberail.com.my)>, a joint venture between the national railroad company (KTM) and TMB, has laid around 1'600 kilometres of fibre optic cable along the nation's railways in Peninsula Malaysia. Fiberail positions itself as a neutral wholesale provider since it does not compete on the consumer market.

One recurring theme among policy makers and industry analysts is that Malaysia may have too many backbones. Each major operator has built some type of nationwide connectivity whether through microwave, satellite or fibre-optic cable. Although this provides a high degree of redundancy, there is considerable excess capacity.

### 2.1.6 Long distance

The five operators all provide national and international long distance telecommunication services. One sticking point has been over equal access (EA). This refers to users being able to access the services of any operator for their long distance needs. So far, EA in Malaysia has been implemented on a call-by-call basis. Users enter the prefix of the EA operator they want to use in front of the number they are dialling. Moves to introduce pre-selection, that is have the users' favourite EA operator hard-coded so that it is no longer necessary to dial their prefix, have been delayed. One reason is the expense that TMB would incur to alter its switches to support pre-selection. TMB argues that this cost should be shared among EA operators.

### 2.1.7 Tariffs

TMB has a socially progressive tariff scheme for telephone line rentals, in line with government policy to reduce differences between urban and rural areas and to promote a high level of household telecommunication access. Different fixed line monthly charges apply for business and residential users, according to the size of the

**Table 2.2: Monthly telephone service charges**

TMB, 2001

Exchange Line Capacity	Business Rate (Monthly) PENINSULA	Business Rate (Monthly) SBH/SWK	Residential Rate (Monthly) PENINSULA	Residential Rate (Monthly) SBH/SWK
Exceeding 500 lines	35 \$ 9.21	30 \$ 7.89	20 \$ 5.26	20 \$ 5.26
500 and below lines	20 \$ 5.26	20 \$ 5.26	18 \$ 4.74	13 \$ 3.42

Source: ITU adapted from TMB.

telephone exchange users are connected to, and whether the user is in Peninsula or in Sabah/Sarawak (see Table 2.2).

Malaysia utilizes a usage-based system for local calls where users are charged for the length of the call. The Government opted for this system in 1996. Previously it had used a flat rate system of 10 sen per local call. The minimum call charge is 9 sen for the first three minutes and 3 sen per minute after that. Local call charges are uniform throughout Malaysia. There is no reduced local call charge for off peak periods.

National long distance calls are priced according to distance and time. TMB uses four charging bands (see Table 2.3). Most operators start with the same base rates and then distinguish themselves from the others by offering rebates or promotional packages.

Like national long distance charges, basic prices for international long distance are roughly the same for the operators. Differences arise over special packages. Another development is IP Telephony. TMB has introduced the iTalk VoIP prepaid card.

**Table 2.3: National long distance prices**

December 2001

DISTANCE (Kilometres)	Seconds per charging unit		Rate per minute, RM		Rate per minute, US\$	
	Full Rate	Reduced Rate	Full Rate	Reduced Rate	Full Rate	Reduced Rate
Not exceeding 50	60	90	0.13	0.09	\$ 0.03	\$ 0.02
Exceeding 50 but not exceeding 150	20	40	0.39	0.20	\$ 0.10	\$ 0.05
Exceeding 150 but not exceeding 550	7.5	15	1.04	0.52	\$ 0.27	\$ 0.14
Exceeding 550	4	8	1.95	0.98	\$ 0.51	\$ 0.26

Note: Charging unit is 13 sen. Full (peak) rate is 7.00am-7.00 pm.

Source: ITU adapted from Telephone Regulations 1996 and TMB.



It costs RM1 per minute to 27 countries and RM2 to another 13 countries. Savings are considerable; a normal call to US is typically RM3 per minute while with iTalk, the price is RM1 per minute.

**2.1.8 Mobile market**

In 1985, Malaysia became the first country in South East Asia to launch a cellular mobile network. The Malaysian mobile industry has gone through several up and downs since then. It has evolved from a monopoly analogue environment to competition, seen the introduction of digital services, witnessed investment by strategic foreign operators, and to a certain extent, consolidation. After experiencing respectable growth in the mid-1990s, the industry stagnated during the Asian financial crisis. However, since 1999, the mobile market has been on a rebound. Growth has been such that the number of mobile subscribers surpassed the number of fixed telephone users in 2000. The launching of mobile Internet services such as Wireless Access Protocol

(WAP) and General Packet Radio Services (GPRS) in 2001 are precursors to eventual third generation networks.

Mobile cellular communications commenced in Malaysia in 1985 when Telekom Malaysia launched its analogue NMT-based ATUR 450 service. Competition was introduced in September 1989, when Celcom launched its ETACS-based ART 900 network. A third operator entered the market in June 1994 when Mobikom launched an AMPS network. Competition reached its peak following the launching of five new GSM networks in 1995. Today, Malaysia has 8 cellular networks owned by five companies (see Table 2.4).

The winding down of analogue networks, TMB's desire to become a more active mobile player and moves towards mobile Internet have been the most significant developments over the last few years. TMB's analogue network ATUR 450 reached its peak of 73'000 subscribers in 1996. In an effort to become a more significant mobile player, TMB

**Table 2.4: Mobile cellular operators in Malaysia**

Operator	Launch	Type	Subscribers (000s)	Distribution of Malaysia cellular market, By subscriber, December 2000
Maxis	Aug-95	GSM900	1'446 (Dec. 2000)	<p><b>Total = 5.2 million</b></p>
Celcom			2'075 (Sep. 2001)	
ART900 GSM	Sep-89 Sep-95	ETACS GSM900	187 1'888	
DiGi	May-95	GSM1800	883 (Dec. 2000)	
TIMECel	Aug-95	GSM1800	401 (Dec. 2000)	
TMB			1'232 (Sep. 2001)	
ATUR 450 Mobikom TMTouch	1985 1994 Sep-95	NMT450 AMPS/DAMPS GSM1800	724 (Dec. 2000)	

Source: ITU adapted from company reports.



consolidated its ownership in Mobikom by purchasing all of the shares and purchased a GSM 1800 operator and renamed it as TMTouch. Overall, the share of digital GSM to total mobile subscribers in the country stood at 92 per cent at the end of 2000.

Mobile tariffs had been regulated until August 2000. The government-imposed annual RM60 license fee was also revoked just prior to August 2000. Mobile tariffs are similar across operators although lately there have been moves to distinguish different pricing elements to attract new subscribers. Some operators have dropped connection and SIM card charges while others charge RM50. Monthly access charges range between RM30–60. Call charges are divided according to distance like fixed long distance charges. Local call charges range from 20-30 sen peak and 15–20 sen off-peak. Some operators offer flat nationwide usage charges. Interestingly, none yet offers free airtime minutes, possibly because of the practice of charging for national long distance charges.

Pre-paid launched relatively late in Malaysia but has been catching on fast. Pre-paid packages bundling in a handset are available for as little as RM250, 0.8 per cent of average annual household income.<sup>14</sup> With some operators claiming population coverage of around 90 per cent, mobile in Malaysia offers widespread universal telephone access.

SMS has been slow to take off because of relatively high message charges and the fact that inter-operator SMS did not exist until June 2001. A reduction in pricing and the inclusion of a certain number of free monthly messages is beginning to stimulate SMS usage. Applications such as purchasing cold drinks from vending machines or ordering movie tickets using mobile phones are starting to catch on.

All operators launched WAP and GPRS beginning in mid-2000 through mid-2001. They all have WAP portals and though initial take-up was slow due

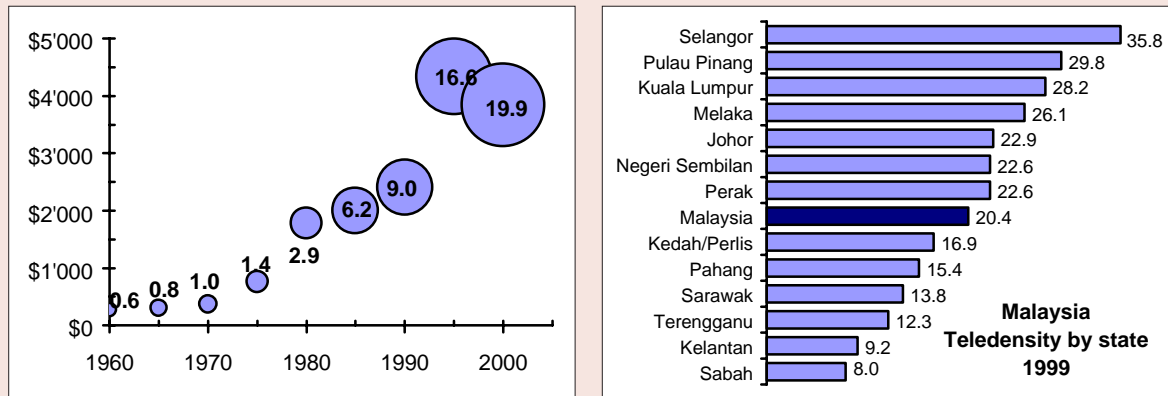
to a shortage of handsets and slow speeds, like SMS, mobile Internet is beginning to show promise.

The government has taken a unique approach to third generation (3G) mobile. It issued a discussion paper on 3G in November 2000.<sup>15</sup> One of the proposals was to encourage virtual mobile operators to avoid environmental pollution from multiple antennas and costly duplication of infrastructure. In other words, spectrum would be awarded to a few operators for constructing the physical infrastructure while there would be multiple service provider licenses. Under Malaysia's technology-neutral licensing scheme, if existing network facilities licensees won 3G spectrum, they would not need to be awarded an application service license. This was confirmed in a statement released in December 2001 where the government announced that it would award sufficient 3G spectrum for three network facilities providers.<sup>16</sup> The award would be based on a beauty contest taking into consideration factors such as network sharing, experience, financial strength, roll-out, technology transfer and local development of 3G equipment and applications. Each winner would pay RM50 (US\$13.2) million payable over the 15-year life of the spectrum award as well as annual spectrum maintenance fees. It has been estimated that it would cost an operator US\$1 billion to construct a 3G network in Malaysia. Tender documents are to be issued in February 2002, the award of frequencies made by July 2002 and expected roll-out of networks in late 2003.

### 2.1.9 A phone for all

Malaysia has made tremendous strides in providing universal access to telecommunication services. From less than 50'000 main telephone lines in 1960, the network has grown to over 4.5 million by 2000. Teledensity (main telephone lines per 100 inhabitants) has grown 34 times over the same period, from 0.6 to 19.9. The rise in teledensity has paralleled

Figure 2.3: Malaysian teledensity



Source: ITU, Telekom Malaysia.

Malaysia's impressive economic growth (see Figure 2.3, left chart). This connection is particularly apparent in 1999, when Malaysia's teledensity declined marginally. The drop was related to the impact of the Asian financial crisis which saw Malaysia's GDP per capita drop by more than US\$ 1'000 per person between 1997 and 1999. In the year 1999, Malaysia's economy began its recovery and teledensity rose again.

As in most countries, there is considerable variation in telecommunication access. Teledensity across Malaysia's states ranges from a low of 8 in the far western state of Sabah to 36 in the west central peninsula state of Selangor (also the site of the new airport and the Multimedia Super Corridor) (see Figure 2.3 right chart). Despite having only 15 per cent of Malaysia's population, 25 per cent of all telephone lines are in Selangor.

Malaysia has also made impressive strides in household telephone penetration, the basic measurement of universal service. Less than 10 per cent of Malaysian families had a fixed telephone line twenty years ago whereas by the end of 2000, that figure had risen to 69 per cent. Growth

in new residential telephone lines reached a peak of some 340'000 in 1994 and has been declining since then. This is puzzling since some 37 per cent of households do not yet have a fixed line telephone and there was a waiting list of 98'000 at the end of the year 2000. It appears unlikely that the lack of home fixed telephones is solely because of economic reasons. The cost of owning a telephone (line rental and 100 calls per month) is less than two per cent of household income. This includes factoring in lower incomes for different ethnic groups or rural inhabitants. Another explanation may be that it is too costly to serve those still without home telephones.<sup>17</sup> These homes may also be opting for mobile service that has grown tremendously over the last few years.

Malaysia has taken a number of steps to reduce discrepancies in nationwide telephone access. A rural public telephone programme has been successful in installing at least one public telephone in all of Malaysia's some 40'000 villages. The country's telephone tariffs are also pro-rural in that fixed line rentals are cheaper for inhabitants of Sabah and Sarawak and those connected to small exchanges.

MCMC has produced a Universal Service consultation paper.<sup>18</sup> It proposes to create a fund to which all operators would contribute based on their revenue. Under the previous universal service regime, TMB has been designated as the Universal Service Obligation (USO) provider, a position it is to hold until the end of 2001 and receives contribution from the fund for providing service in uneconomic areas. Amongst others, the discussion paper proposes having operators assume this responsibility in areas where TMB is not present. The paper also distinguishes between collective and individual access. Collective access is through public locations such as payphones whereas individual access is availability of service in the home. Priority should be given to collective access. The discussion paper also suggests that Internet access should be included in the definition of universal service.

### 2.2 Malaysia's Mass Media

Malaysia has an evolving media scene. There has been a gradual transformation from government-only media outlets, particularly for broadcasting, to include new privately owned channels.<sup>19</sup> Newspapers and broadcasting is available in the languages of all the main ethnic groups in the country. The media industry has seen rising advertising expenditures fuelled by a growing

consumer economy. After a decline during the financial crisis, advertising expenditures are back on track and were estimated to have risen 18 per cent in 2000 to RM 3 billion (US\$ 790 million).<sup>20</sup>

Before MCMC came into the picture, responsibility for media content rested solely with the **Ministry of Information** <[www.kempen.gov.my](http://www.kempen.gov.my)>. Duties of the ministry include enforcing the advertising code, establishing broadcasting guidelines and collecting broadcasting fees. The national news agency, Bernama <[www.bernama.com](http://www.bernama.com)>, also falls under the Ministry of Information. The MCMC is responsible for networked electronic media content.

Media companies are moving into Internet activities through portals, online program guides and audio and video streaming of broadcasts. Internet access provision over broadcast infrastructure is also being tested.

#### 2.2.1 Printed press

According to UNESCO, in 1996 there were 42 daily newspapers in 1996. Newspaper circulation was estimated at 159 per 1'000 inhabitants in 1998.

*The New Straits Times Press* (NSTP) produces a number of newspapers in the nation's different languages. Its e-media portal <[www.emedia.com](http://www.emedia.com)>

#### Box 2.1: Malaysiakini.com

Reportedly the most popular Malaysian web site, Malaysiakini.com is unpopular among the government. Started with the help of a US\$ 100'000 grant from Bangkok-based South East Asian Press Alliance, Malaysiakini is attempting to fill the void in controversial press coverage left by Malaysia's traditional media. Launched in November 1999, Malaysiakini receives around 100'000 visitors a day. It acknowledges that it hopes to "test and push the boundaries of free speech in the country."<sup>21</sup> The site has won several awards for its reporting.

Ironically, though the site is hosted in Malaysia, it has not been shut down because the government is legally bound to not censor the Internet. The

government has also resisted cries for Internet sites to be included under the nation's press laws. Instead, the government has taken other approaches. It has spoken out about the dangers of an irresponsible press to the country's multi-ethnic and community-oriented society. It has also launched its own site to counter alleged lies and distortions.

While the government is faced with the dilemma of not wanting to censor the Internet, Malaysiakini is faced with the dilemma many dot-coms around the world are facing—how to make money. Faced with a cash shortage, Malaysiakini may go under if a plan to raise revenue from by charging for content is not successful.

[my](http://www.thestar.com.my)> was launched in February 2000 to consolidate the company's publications into one web site including access to archived editions. *The Star*, which claims to have the largest circulation of English language newspapers in Malaysia, has a web site at <[www.thestar.com.my](http://www.thestar.com.my)>.

### 2.2.2 Broadcasting

Radio broadcasting dates back to 1921 when an engineer brought the first set into the country. Television broadcasting commenced on 28 December 1963. The government operated radio and television stations are under *Radio Television Malaysia (RTM)* <[www.rtm.net.my](http://www.rtm.net.my)>, within the Ministry of Information. The MCMC issues infrastructure and content licenses for the broadcasting industry.

#### 2.2.2.1 Radio

RTM has five radio channels that broadcast in Bahasa Melayu, Mandarin, Tamil and English as well as indigenous languages for listeners in Sabah and Sarawak. There are also several private radio chains.

Statistics from 1994 put radio coverage at 95 per cent in Peninsula Malaysia and 85 per cent in Sabah and Sarawak. According to UNESCO, there were 9.1 million radio sets in Malaysia in 1997 or 434 per 1'000 inhabitants.

#### 2.2.2.2 Television

There are four active terrestrial television channels in Malaysia. RTM operates two nationwide channels, TV1 and TV2. TV1 broadcasts in Bahasa Melayu while TV2 broadcasts in Bahasa Melayu, Chinese, Indian dialects and English. Both TV1 and TV2 are available online through video streaming.

*Sistem Televisyen Malaysia Berhad (TV3)* <[www.tv3.com.my](http://www.tv3.com.my)> was launched in June 1984 as Malaysia's first private television channel. TV3 broadcasts are in Bahasa Melayu, Chinese and Indian

dialects as well as English. TV3 is partly owned by Malaysian Resources Corporation Berhad (which also partly owns several newspapers) while the remainder of shares are traded on the KLSE. TV3 claimed 46 per cent of TV viewers in 2000.

*Natseven (ntv7)* <[www.ntv7.com.my](http://www.ntv7.com.my)> was launched nationwide on 7 April 1998. It offers Bahasa Melayu, English, Chinese and Indian programmes. NTV7 reaches about 90 per cent of urban audiences. Its share of viewers was 35 per cent in September 2000.

*Metrovision*, which launched in July 1995, experienced financial difficulties during the financial crisis and shut down in November 1999. There are rumours that it may re-launch.

Statistics from 1994 put over-the-air television coverage at 90 per cent in Peninsula Malaysia and 85 per cent in Sabah and Sarawak. According to AC Nielsen, 97 per cent of Peninsula Malaysian homes have a TV set.<sup>22</sup> However, overall household television penetration is around 80 per cent.

#### 2.2.2.3 Multichannel television

Wireless pay television is provided by **Cableview Services Sdn Bhd** <[www.megatv.com.my](http://www.megatv.com.my)>. Its *Mega TV* service uses Multi-channel Multi-point Distribution System (MMDS) via microwave transmission to redistribute satellite channels.

**Table 2.5: Malaysia's TV viewers**

2000

Item	Value	Note
Estimated television households (000s)	4'000	ASTRO estimate
% Households with TV	81%	
Cable TV households (000s) (MMDS)	10	MegaTV report
As % of TV households	0.3%	
Satellite Dishes (000s)	525	Astro
As % of TV households	13%	

Source: ITU adapted from sources shown.

Cableview was incorporated in October 1994. Its owners include Sistem Televisyen Malaysia (TV3), Minister of Finance, Eurocrest, Ibox TV and Sri Utara Sdn Bhd. There are eight channels available including news (CNN), sports (ESPN) and cartoons (Cartoon Network). The service is available in the Central (Klang Valley) and Southern (Seremban, Melaka Tengah) regions of Peninsula Malaysia. The decoder is loaned for free. Installation costs RM 99 (US\$ 26.05) and the monthly subscription is RM 45 (US\$ 11.84).<sup>23</sup> Due to the last financial crisis, MegaTV ceased operation on 1 October 2001. The current shareholders are presently in the midst of restructuring the company.

Satellite TV is provided by **MEASAT** Broadcast Network Systems Sdn Bhd (MBNS) <[www.astro.com.my](http://www.astro.com.my)>. Marketed under the brand name 'ASTRO', the 'direct-to-home' (DTH) digital satellite broadcasting services offers up to 36 television channels and 16 digital radio channels and 2 premium channels. In addition, there are specially developed local channels - RIA (Malay), AEC

(Chinese), Wah Lai Toi (Chinese), Vaanavil (Indian), ASTRO Super Sports (English) and ASTRO Stocklink, an interactive channel. On 1 January 2002, ASTRO introduced its Flexi Packages to its subscribers. Subscribers choose a combination of packages starting from RM44.95 to a maximum subscription of RM99.95.

ASTRO's service is delivered via Ku-band from the Malaysia East Asia Satellite (MEASAT) which covers Malaysia and other South East Asian countries. The MEASAT System also has a high-powered C-band footprint, which covers a large part of East Asia stretching from coastal China to Indonesia and from Myanmar to the Philippines.

MBNS has built one of the largest broadcast production facilities in the world. Its All-Asia Broadcast Centre (ABC) will be able to send and receive broadcast signals to and from the region. MBNS shareholders include Khazanah Nasional Berhad (an investment holding company of the Malaysian Government), Bumiputera trusts and Usaha Tegas Entertainment Systems.

- <sup>7</sup> For more on the history of telecommunications in Malaysia see <http://www.telekom.com.my/tmhistory/index.htm>.
- <sup>8</sup> <http://www.cmc.gov.my/legis-acts-frame.htm>.
- <sup>9</sup> The inclusion of electricity in a multimedia portfolio is not by accident. Electricity is a fundamental infrastructure and often necessary for telecommunications and computing equipment.
- <sup>10</sup> MCMC took over the regulatory functions of the Postal Department on 1 November 2001.
- <sup>11</sup> Dr Syed Hussein Mohamed. "Public Action: Regulation or Economic Incitement." Address to the World Summit of Regulators on the Internet and the New Services, Nov-Dec 1999. [http://www.cmc.gov.my/cmc\\_papers/10CSA-UNESCO99-011299.doc](http://www.cmc.gov.my/cmc_papers/10CSA-UNESCO99-011299.doc).
- <sup>12</sup> TMB had already been established as a corporate entity back in October 1984. Note that JTM retained responsibility for telecommunication regulation.
- <sup>13</sup> Subsequent sales and share increases and buybacks have altered TMB's ownership. At the end of 2000, five government agencies controlled 81.42 per cent of the shares. Khazanah Nasional Berhad, a wholly owned company of the Ministry of Finance (35.91%), Minister of Finance (21.06%), Employees Provident Fund Board, social security system (11.44%), Bank Negara, central bank (8.15%) and Permodalan Nasional Berhad, government investment company (4.86%).
- <sup>14</sup> Even for the poorest 40 per cent of households, a mobile pre-paid package including a starter phone is only 2.4 per cent of yearly income.
- <sup>15</sup> "Concepts and Proposed Principles on the Implementation of Mobile Cellular Service in Malaysia." [http://www.cmc.gov.my/dis-papers/IMT-2000\\_discussion\\_paper.pdf](http://www.cmc.gov.my/dis-papers/IMT-2000_discussion_paper.pdf).
- <sup>16</sup> "Statement on Implementation of 3<sup>rd</sup> Generation Mobile in Malaysia." <http://www.cmc.gov.my/pressreleases/statement-3G.pdf>.
- <sup>17</sup> TMB states that it is committed to reducing the waiting list, especially in rural areas, "through the use of new wireless technology that is more economical and faster to install." Telekom Malaysia Berhad. *Annual Report 2000*. Corporate Communications Division. April 2001.
- <sup>18</sup> There is already an existing pre-CMA Universal Service regime in Malaysia, introduced in 1998 by JTM. Under CMA, MCMC shall determine a Universal Service Provision (USP) system and for that purpose, it issued a discussion paper as part of a Public Inquiry process. A Commission Determination on USP was published in April 2001. [http://www.cmc.gov.my/dis-papers/USP\\_FINAL.pdf](http://www.cmc.gov.my/dis-papers/USP_FINAL.pdf).
- <sup>19</sup> Some media watchdogs consider Malaysia's press laws to be restrictive and allege that the media practices self-censorship to avoid problems. See Freedom House. "Country Ratings. Press Freedom Worldwide." 1 January 2000. <http://www.freedomhouse.org/pfs2000/reports.html#maly>.
- <sup>20</sup> Ariff Awang. "Advertising expenditures to hit RM3b this year." Business Times. 11 December 2000. <http://adtimes.nstp.com.my/archive/dec11a.htm>>
- <sup>21</sup> "About Malaysiakini." [www.malaysiakini.com/leftbar/aboutus.html](http://www.malaysiakini.com/leftbar/aboutus.html) [Accessed 10 December 2001]
- <sup>22</sup> ACNielsen. 'Asia Pacific TV Penetration.' [www.casbaa.com/members/regional\\_databank/asiatvpenetration.htm](http://www.casbaa.com/members/regional_databank/asiatvpenetration.htm).
- <sup>23</sup> Mega TV ceased operation on 1st October 2001

### 3. Internet

#### 3.1 Off to an early start

The roots of Malaysia's Internet development can be traced back to 1988 when the Malaysian Institute of Microelectronic Systems (MIMOS) set up a university computer network called *Rangkaian Komputer Malaysia* (Malaysian Computer Network), *RangKom*.<sup>24</sup> It had four dial-up lines to Australia, the Republic of Korea, Netherlands and the US and offered e-mail and participation in news groups. In 1992, the expensive dial-up connections were replaced by a satellite link to the US and Malaysia obtained a permanent connection to the Internet. MIMOS established the Joint Advanced Integrated Networking (JARING) as an Internet Service Provider (ISP). JARING remained the country's only ISP until Telekom Malaysia Berhad's (TMB) TMnet received a license in July 1996 and launched its service in November. The market remained a duopoly until the year 2000 when additional licenses were granted.

#### 3.2 TMnet reigns supreme

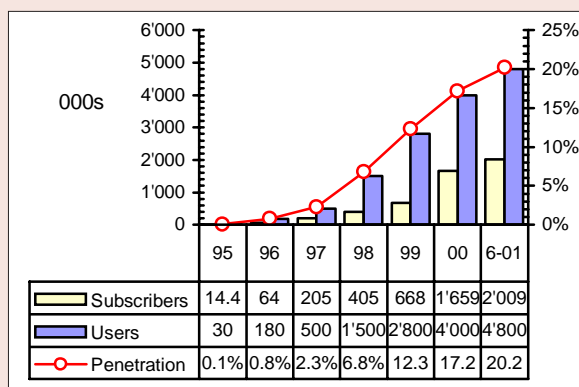
According to the Malaysian Communications and Multimedia Commission (MCMC), there were two million Internet subscribers at June 2001.<sup>25</sup> PIKOM, the Association of Computer and Multimedia Industry of Malaysia, estimates that there were some four million users at December 2000, translating into a penetration of 17.2 per cent of the population.<sup>26</sup> Though the ISP market has been liberalized, TMnet reigns supreme. At June 2001, TMnet had 1.05 million subscribers, claiming 70 per cent of the Malaysian market, and making it the largest ISP in South East Asia.<sup>27</sup>

#### 3.3 Not so broadband

Despite the strong government emphasis on multimedia and the establishment of the Multimedia Super Corridor (MSC), Malaysia has a low level of local broadband access to the Internet. Apart from the business sector, few homes or small businesses had high-speed access at the end of 2000. Part of this is due to a lack of options. There is a limited cable television market in Malaysia and only few subscribers use wireless technology. Thus, high-speed access via cable modem is not a short-term option. The rollout of Asynchronous Digital Subscriber Line (ADSL) has been slow. This seems to be due to delay on the part of the incumbent operator, owner of most of the fixed lines in the country. The delay may be commercial as TMB seeks to prevent a fall in revenues from costlier leased lines or other data services (i.e., ISDN and packet-switch networks).

Another inhibiting factor is regulatory reservations to require TMB to unbundle its local line offering to allow others to provide ADSL service or to provide attractive wholesale rates. It is not certain that the benefits of

**Figure 3.1: Internet market**



Source: ITU adapted from MCMC, Pikom.



unbundling the local loop will exceed the costs of such a move. TMB's competitors have also not yet demonstrated that they are really serious in providing ADSL service to their own directly-connected subscribers. Yet another cause for the slow take-up is that competitors have not been willing to make the costly investment in providing local lines. Some argue that the demand is not there.<sup>28</sup> Wireless routes to broadband access are being investigated including Direct-to-Home satellite and Fixed Wireless Access. In December 2001, the MCMC released radio spectrum to facilitate the provision of broadband through Fixed Wireless Access.

The first ADSL installations were made by TMB in the MSC in March 2000. TMB had plans to roll out 30'000 ADSL lines in urban areas in 2001.<sup>29</sup>

### 3.4 Not exchanging traffic

For all of Malaysia's ICT innovations, one surprising weakness is that there is no public Internet traffic exchange. Only TMnet and Jaring have public peering. Other ISPs must make private arrangements. As a result, not all local Internet traffic stays within the country, adding to demand for expensive international connections. For a nation so preoccupied with network duplication and conserving resources, this is a surprising situation. Ironically, Malaysia is vying to be the location for the proposed ASEAN Internet backbone (Asia Regional Internet Exchange (ARIX)) that would interconnect public Internet exchanges throughout the region.<sup>30</sup>

Both TMnet and Jaring have high-speed dedicated national Internet fibre backbones.

ISPs are free to install their own international gateways as long as they have a network facilities license. Telekom Malaysia has 345 Mbps of international Internet connectivity. Jaring's international bandwidth is 150 Mbps. According to Maxis web site, it has 90 Mbps of international

Internet bandwidth. Digi's international bandwidth is unknown but it has a link to the Singapore Internet Exchange (STIX). Celcom has 8 Mbps of international connectivity.

### 3.5 Convergence or confusion?

The MCMC is responsible for licensing ISPs. In order to provide Internet access service, a company need simply register with MCMC to obtain a *class* Application Service Provider (ASP) license. However, this is akin to a resale license and does not allow the company to provide its own infrastructure. A potential ISP must either lease the necessary equipment from other licensed providers or acquire their own Network Facilities Provider and Network Service Provider licenses. By December 2001, the MCMC had issued 110 class ASP licenses. However, it should be noted that not all of these licenses are for Internet access provision. Of those for Internet access, most of the companies are not in business. Indeed the Internet market is highly concentrated and it is estimated that the two leading ISPs control over 90 per cent of the dial-up market.

Licensed companies are allowed to provide Voice over Internet Protocol (VoIP). Companies must obtain an individual ASP license. There were 18 licensed VoIP providers in December 2001. Note that PC-to-PC and PC-to-PSTN Internet telephony is legal and does not require a license.

There is no formal content control of the Internet in Malaysia. Legally, it is not allowed as stated in the Communications and Multimedia Act: "Nothing in this Act shall be construed as permitting the censorship of the Internet."<sup>31</sup> The MCMC hopes to deal with content issues through industry codes of practice and self-regulation. There is a category of license called 'Content Application Service Provider' but other than broadcasting entities, no other companies have been licensed. It is not clear whether this category of license would also refer to Internet content providers.



**Table 3.1: MY registrations**

Total number of registrations, 1995 - 2000

Year	*.com.my	*.net.my	*.org.my	*.gov.my	*.edu.my	*.mil.my	Yearly Total
1995	100	3	4	31	13	0	151
1996	537	32	30	73	42	0	714
1997	1'306	61	37	57	30	0	1'491
1998	2'061	86	42	62	61	0	2'312
1999	4'738	222	144	64	63	0	5'231
2000	10'048	378	192	51	74	0	10'743
<b>Total</b>	<b>18'790</b>	<b>782</b>	<b>449</b>	<b>338</b>	<b>283</b>	<b>0</b>	<b>20'642</b>

Source: MYNIC.

### 3.6 MY Malaysia

Electronic addressing, in particular, Domain Name Administration in Malaysia has been under the purview of MIMOS since 1987 when the Internet Assigned Numbers Authority (IANA) delegated the ".my" country code Top Level Domain (ccTLD) to Dr Mohamed Awang Lah, an employee of MIMOS. Currently, the task of managing domain name registration is handled by the Malaysian Network Information Centre (MYNIC) <[www.mynic.net](http://www.mynic.net)>, a unit of MIMOS.

The .my domain is structured with six second level domains: com.my - for commercial organizations; net.my - for network-related organizations; org.my - for organizations which do not qualify for other categories; edu.my - for Malaysian educational organizations; gov.my - for Malaysian government; and mil.my - for Malaysian military (even though there are currently no registrations under that category). Only organizations and not individuals can apply for a domain name. Registration for .com, .net and .org can also be done through resellers. There is a RM 100 (US\$ 26.32) registration fee and RM 100 annual renewal fee. By October 2001, there were 27'463 registrations for the .my domain with an average of almost 700 new registrations per month during 2001.

With the passing of the Communications and Multimedia Act 1998 (CMA

1998), the task of managing electronic addressing and numbering has been assigned to the Malaysian Communications and Multimedia Commission (MCMC), which was established under the Malaysian Communications and Multimedia Commissions Act 1998 (MCMCA 1998). This would mean that Domain Name System Management, which was largely unregulated previously, has found a new home.

Under Chapter 2 of Part VII of CMA 1998, MCMC is vested with the "control, planning and administration of numbering and electronic addressing" (Section 179 (1) and (2)) and "numbering or maintenance of an integrated public number or electronic address database" (Section 181 (1), (2) and (3)).

### 3.7 The price is right

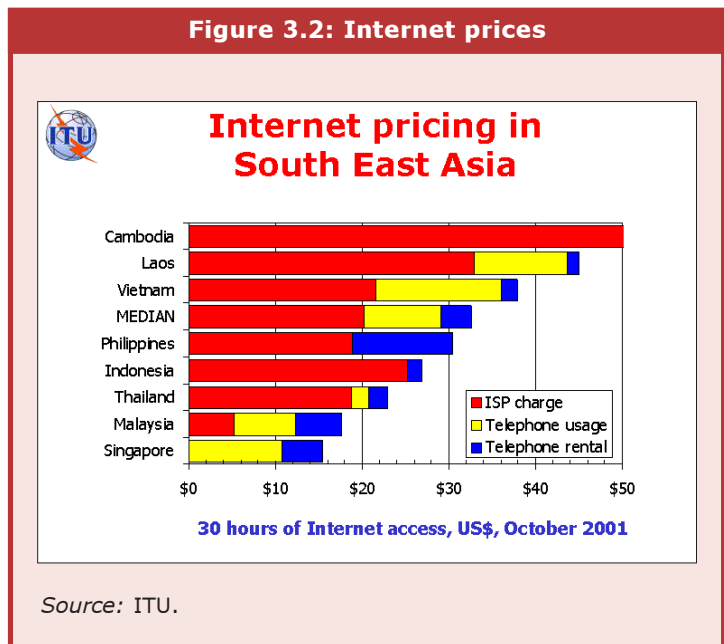
One positive impact on Malaysia's Internet development has been its dial-up rate policies. The country has the second lowest dial-up Internet prices in South East Asia, just above Singapore (see Figure 3.2). A major reason is that dial-up Internet access using a special 151x code is regulated at a lower rate than voice telephone calls. TMnet, for example, charges 2.5 sen (0.7 US cent) per minute for dial-up Internet access (1.5 sen for the dial-up charge to the telco and 1.0 sen for the Internet access charge) compared to 3 sen per minute for local calls. This innovation was a

first in the world when it was launched back in 1996.<sup>32</sup> The dial-up Internet access service using 151x code is also available nationwide.

The regulated dial-up Internet access rate for the 151x service is not without its critics. Some ISPs complain that the rate is below cost and that they cannot compete, particularly since in order to provide a nationwide service, their users must utilize TMB's fixed lines. Maxis, which launched a 'free' Internet service (with users only paying the dial-up charge) was forced to abandon it in October 2001 and moved to a flat-rate RM 10 per month service. It rebates half a sen (0.5 sen) of the dial-up charge.

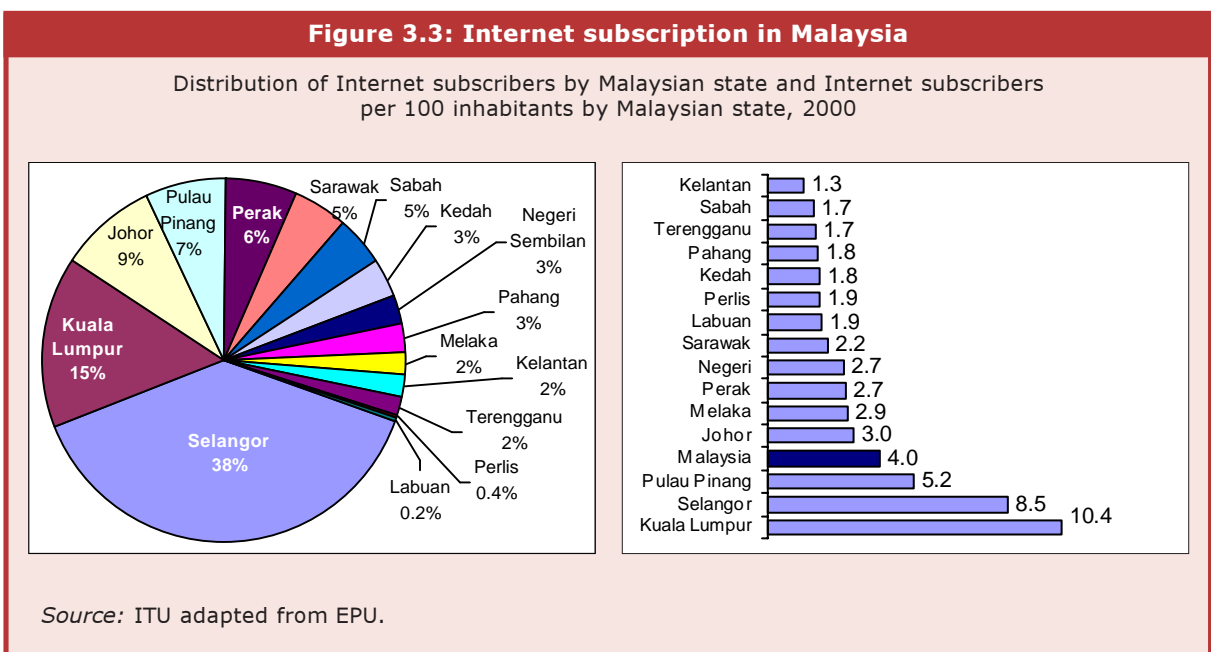
**3.8 Universal ICT access**

There is great concern within the government about a Malaysian Digital Divide, particularly in differences in access between urban and rural areas. Data for the end of 2000 show that 54 per cent of Malaysia's Internet subscribers were in Kuala Lumpur and the surrounding state of Selangor even though these two locations only account for 24 per cent of Malaysia's population. Internet subscriber penetration for the country as a whole



stood at four per cent at the beginning of 2001. There are large variations in access with over 10 Internet subscribers per 100 inhabitants in Kuala Lumpur to less than two in seven states.

In order to address these gaps, the government has moved in two directions. First, it has done some analysis of the issue and tried to



understand the demographics of those without ICT access. In a thought-provoking paper, the NITC provides a definition of ICT access:

- a. *Physical possession and/or availability of information and communication equipment such as radios, televisions, telephones, computers, software and networks;*
- b. *Financial means to afford and use ICT products and services; and*
- c. *Basic skills or capabilities to use and the actual usage of ICT products and services.*<sup>33</sup>

The paper also notes that there will always be those who will not want to use ICT even if access were free. The paper then goes on to analyze those who do not have access to ICTs based on social, demographic and economic criteria. It suggests that solutions for these groups cannot be standardized.

Second, the government has launched a number of initiatives to deal directly with the problem, particularly in rural areas. For example, the *Gerakan Desa Wawasan* project was launched in 1996. Village authorities were provided with PCs to assist with their administrative tasks. Almost 1'000 villages had been enrolled in the project by the end of 2000. In March 2000, the *Internet Desa* (Rural

Internet Centres) programme was launched at two pilot villages of Sungai Ayer Tawar in Selangor and Kanowit in Sarawak. PCs with free Internet access were provided at post offices. In addition a special web portal was created providing information on government services and local activities. At the end of 2001, some additional 12 centres were implemented. The e-Bario project, coordinated by the University of Malaysia Sarawak campus, has been working to provide ICT access in the remote village of Bario in Eastern Malaysia (see Box 3.1). Another initiative includes programmes to bring ICT to schools (see Education section in Chapter 4). The private sector has also been active. For example, Maxis has established a number of rural Internet access centres at Shell's petrol stations.

Internet access is included in Malaysia's definition of universal service.<sup>34</sup> This includes the goal of providing all communities and households with access to the Internet at speeds of at least 128 kbps (e.g., basic rate ISDN). Collective access through public locations such as libraries and schools is to be targeted first.

One bottleneck to higher ICT access is the low level of personal computers (PCs) penetration. The NITC paper mentioned above, points out that

### Box 3.1: e-Bario<sup>35</sup>

Bario is a remote community in the state of Sarawak in Eastern Malaysia. With a population of around 1'000 of which the majority are farmers, Bario is so isolated that it is only accessible by a daily flight on a small plane taking about one hour. A two-year project, backed with support from Canada's International Development Research Centre (IDRC), was undertaken to introduce Bario to ICTs. Although most of the population had heard of computers, over 90 per cent had never used one and prior to the project, almost the entire village had never heard of the Internet.

Bario's secondary school was set up with a lab with ten computers. A telecentre was also established for community access to ICT. One of the major

barriers the project faced was obtaining Internet access. Telekom Malaysia eventually established a connection using a VSAT powered by diesel fuel and supplemented by solar power.

A number of findings have emerged from the Bario experiment that could be relevant for other countries keen to introduce ICTs to rural areas. One of the most important is that to be successful, ICTs cannot just be "dropped" into a rural area but must be part of an integrated approach that takes into account the community's information needs and capacity to absorb and use new technology. Researchers also noted many benefits that ICT can provide to a rural village in areas such as health, education, culture, agriculture, commerce and community development.

factoring in the purchase of a PC raises the price of Internet access to almost 90 per cent of a rural household's disposal income. One initiative to overcome the cost is the PC Ownership Campaign, launched in October 1999. This programme allows citizens with children over ten years of age to withdraw their retirement (Employee Provident Fund) contributions to purchase PCs. Some 200'000 individuals had taken advantage of this by the end of 2000. A related activity is a government-industry project with the motto of 'one home, one PC', offering low-priced PCs at special fairs. ISPs have also launched programmes offering lower-priced PCs when signing up for Internet service.

Despite the concern of ICT gaps between urban and rural areas, it appears that at a national level Malaysia is performing well compared

to other countries in universal service to ICT. Though data are sketchy—a situation that should improve after the results on the possession of ICT equipment in households from the 2000 Census are released—there are various estimates that allow a rough picture to be made of ICT penetration in homes. Malaysia holds its own compared to developed nations and is estimated to have a higher home Internet penetration than France. Ironically, the biggest bottleneck for Malaysia does not seem to be a shortage of PCs but rather fixed telephone lines (see Figure 3.4). One factor that has driven Malaysia's relatively high level of home Internet access is attractive dial-up rates.

The government has set a national objective of raising Internet subscriber penetration to 25 per cent of the population by 2005.<sup>36</sup>

### Box 3.2: Universal Service Objectives

#### **Collective access:**

Objective 1: All communities in Malaysia should have reasonable collective access to basic telephony services. Reasonable collective access to basic telephony services may be achieved by ensuring that each community has reasonable access to a public payphone at which a basic telephony service is available.

Objective 2: All communities in Malaysia should have reasonable collective access to Internet services. Reasonable collective access to Internet services may be achieved by ensuring that community centers (such as libraries and schools) receive (upon request within a reasonable time frame) a telephone connection with a minimum data channel of 128 kbps.

#### **Individual access:**

Objective 3: All households (including businesses) in Malaysia should have reasonable individual access to basic telephony services. Reasonable individual access to basic telephony services may be achieved by ensuring that each household (or business) receives (upon request within a reasonable time frame) a basic telephony service.

Objective 4: All households (including businesses) in Malaysia should have reasonable individual access to Internet services. Reasonable individual access to Internet services may be achieved by ensuring

that each household (or business) receives (upon request within a reasonable time frame) a telephone connection which has the capability to support Internet services.

#### **Basic telephony service:**

Basic telephony service refers to a service for the purpose of voice telephony which enables an end user using the service to communicate, by means of that service, with other end users who are supplied with the same service (or equivalent service) for the same purpose.

#### **Reasonable access:**

Reasonable access is to be assessed having regard to considerations of equity and economic efficiency, including the commercial viability of installing network facilities or providing network services in particular areas or places.

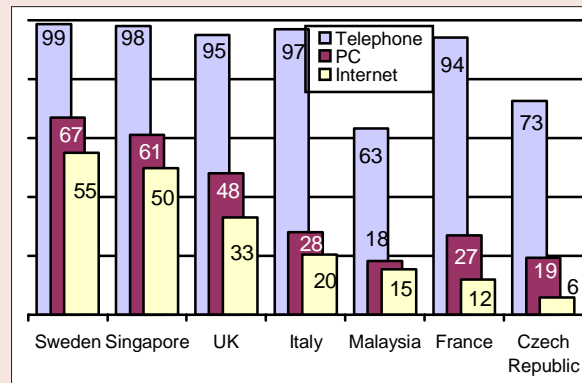
#### **Priority:**

In general, collective access (objectives 1 and 2) will have priority over individual access (objectives 3 and 4) particularly in areas or for groups within the community which do not yet have any basic telephony services. In general, access to basic telephony services (objectives 1 and 3) will have priority over access to Internet services (objectives 2 and 4). In general, objectives 1 and 2 should be achieved before objectives 3 and 4.

Source: MCMC. Universal Service Consultation Paper.

**Figure 3.4: Household penetration of ICT**

Percentage of households, 2000



*Note:* Figures for Malaysia are derived from the following assumptions: For households with a telephone, the number of residential telephone lines divided by the number of households. For household PCs and Internet subscriptions, based on world-wide ratios of home PCs and Internet subscriptions to total.  
*Source:* ITU.

- <sup>24</sup> For more on Malaysia's early Internet history, see Rahmah Hashim & Arfah Yusof. "Internet in Malaysia." *Informatik Forum*. January 1999. <[www.interasia.org/malaysia/hashim-yusof.html](http://www.interasia.org/malaysia/hashim-yusof.html)>.
- <sup>25</sup> Malaysian Communications and Multimedia Commission. "Communications and Multimedia Industry Statistics." Updated November 2001. [www.cmc.gov.my/Industry\\_Statistic.pdf](http://www.cmc.gov.my/Industry_Statistic.pdf).
- <sup>26</sup> See "Estimated statistics for PC and Internet." [www.pikom.org.my/marketinfor/estimatedstatics.html](http://www.pikom.org.my/marketinfor/estimatedstatics.html).
- <sup>27</sup> Telekom Malaysia's figure for the Malaysian Internet market is considerably more than that reported by the MCMC. Based on MCMC data, TMnet's market share would be 52 per cent.
- <sup>28</sup> Telekom Malaysia placed an order for 10'000 DSL lines in October 2000 to be delivered over the next three years. These could be extended to 70'000 'given the right market conditions.' The 70'000 DSL lines amount to only 3.5 per cent of year-end 2000 Internet subscribers in Malaysia which seems appears to be a very low estimate of market demand. See Siemens. "Siemens receives order from Telekom Malaysia for DSL broadband access technology." *Press Release*. 19 October 2000. [http://www.siemens.com/Daten/Presse/2000/10/18/222340200010\\_07\\_e.doc](http://www.siemens.com/Daten/Presse/2000/10/18/222340200010_07_e.doc).
- <sup>29</sup> "Telekom Malaysia Announces its Results for 2000." *Press Release*. 27 February 2001. <http://www.telekom.com.my/pr/010227.htm>.
- <sup>30</sup> [http://www.e-aseantf.org/pilot\\_prj/arix.html](http://www.e-aseantf.org/pilot_prj/arix.html).
- <sup>31</sup> See Part I, Point 3, Paragraph 3. <http://www.cmc.gov.my/legislation/mainlegislation.htm>.
- <sup>32</sup> "Malaysia only country giving Internet concession." *New Straits Times*. 4 June 1996.
- <sup>33</sup> National IT Council. Access and Equity. INFOSOC Malaysia 2000. [www.nitc.org.my/resources/papers.html](http://www.nitc.org.my/resources/papers.html).
- <sup>34</sup> MCMC. "System of Universal Service Provision." Consultation Paper. 21 December 2000.
- <sup>35</sup> Much has been written about the E-Bario project. See: Roger Harris. *Internet Access by Remote Communities in Sarawak: The Smart School as a Demonstrator Application*. May 2001. <http://www.panasia.org.sg/grants/awards/98232fr.htm>  
Jake Statham. 'Roger Harris: Tribal Tech Supporter.' *AsiaWeek*. 29 June 2001. <http://www.asiaweek.com/asiaweek/technology/article/0,8707,132168,00.html>.
- <sup>36</sup> See MCMC. "Framework for Industry Development."

## 4. Information & Communication Technology & the Nation

### 4.1 Government: Towards a K-Malaysia

Malaysia's commitment to Information and Communication Technology (ICT) intensified in the mid 1990s. In 1994, the Prime Minister's Department appointed a team of consultants to determine the necessary steps and strategies for Malaysia to achieve developed country status by the year 2020 (the so-called *Vision 2020*, see Box 1.1). Several recommendations were made regarding ICT development. Based on this input, one of the government's first moves was to form an advisory group to drive the use of ICT as a strategic technology for national development—the **National Information Technology Council** (NITC) <[www.nitc.org.my](http://www.nitc.org.my)>. The NITC, chaired by the Prime Minister, hosted by the Malaysian Institute of Microelectronic Systems (MIMOS) and composed of members

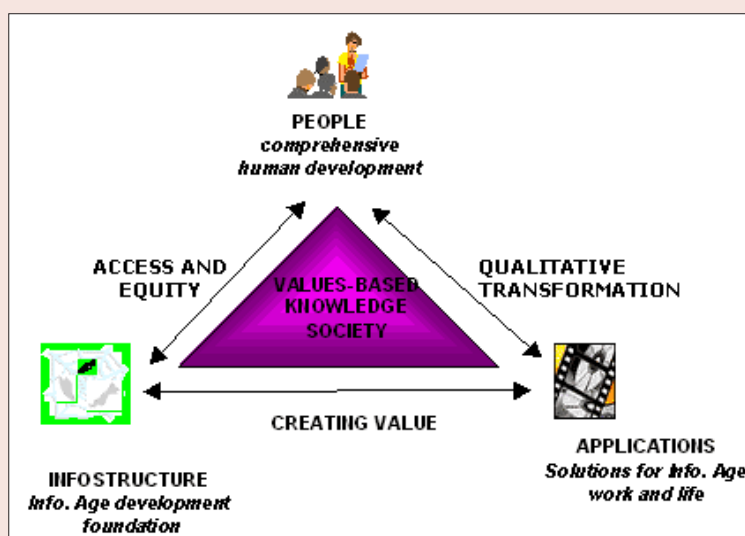
from the public, private and community sectors, launched the National IT Agenda (NITA) in December 1996.

NITA provides a framework for the use of ICT to convert Malaysia into a knowledge-based society (K-society). It views ICT development from three angles: *people*, *infrastructure* and *applications* (see Figure 4.1). It is premised on the concept that with the necessary skills, appropriate hard and soft infrastructure and applications, people will be able to use ICT to transform society. NITA's motto is "*Turning Ripples into Waves*." The idea is that the government can help push ICT by creating ripple-like initiatives that will trigger a tidal wave of change.

Other significant initiatives include the establishment of a new industry policy maker and regulator in 1998 to oversee all communication sectors—broadcasting, telecommunications and information technology (see Section 2.1). A number of projects were launched to stimulate supply and demand on the IT market, the most ambitious one of which is the Multimedia Super Corridor (MSC). Five Cyberlaws were enacted to provide the appropriate ICT regulatory and legal environment for (see Table 4.1).

The government is backing its ICT vision with a serious financial commitment. According to the Eighth Malaysia Plan (2001-2005), RM 5.2 (US\$ 1.37) billion is allocated to ICT development over the next five-year period, or five per cent of the government budget.<sup>37</sup> Funding includes government computerization, flagship ICT

Figure 4.1: The NITA Triangle



Source: NITC.



**Table 4.1: Malaysian Cyberlaws**

Law	Description
Digital Signature Act 1997	Provides for the creation of Certification Authorities to issue digital signatures. Makes digital signatures legally binding.
Computer Crime Act 1997	Makes misuse of computers a criminal offence.
Telemedicine Act 1997	Allows registered doctors to practice 'teleconsultation.'
The Copyright (Amendment) Act 1997	Extends the existing 1987 Copyright Act to include multimedia (e.g., making it illegal to transmit copyrighted works over the Internet).
The Communications and Multimedia Act 1998	Unites and defines regulation for different communication industries (telecommunications, broadcasting and computing).

Source: NITC <[www.nitc.org.my/resources/cyberlaw.html](http://www.nitc.org.my/resources/cyberlaw.html)>.

applications and projects to reduce the Digital Divide.

#### 4.1.1 Government as user

At the heart of government ICT use is the Malaysian Administrative Modernization and Management Planning Unit (MAMPU, <[www.mampu.gov.my](http://www.mampu.gov.my)>), an agency within the Prime Minister's Department. Created in May 1977, MAMPU is charged with introducing improvements in the public sector to make it more efficient and responsive. This makes MAMPU the lead agency for ICT development in the public sector. In that regard, MAMPU participates in the work of the NITC, the MSC Implementation Council and is the secretariat for the Government IT and Internet Committee and the Steering Committee on Electronic Government.

A main MAMPU's programme is *Electronic Government* (EG), one of the flagship ICT projects in the country. The goal of EG is a paperless public sector that enhances efficiency and improves intra-government and citizen and business to government relations. MAMPU is enhancing government ICT use in the area of coordination and standardization. For example, all agencies have to come up with an Information Technology Strategic Plan using MAMPU's standard framework. Government offices can share their ICT

experiences from accessing a database dubbed RAPP (Smart Partnership Application Repository). All agencies were also ordered to appoint Chief Information Officers from senior management in 1999.

In terms of infrastructure, the Government Integrated Telecommunication Network (GITN) had connected 18 agencies by the end of 2000. The GITN provides a dedicated and secure network. In addition, a Virtual Private Network (EG\*Net) connects all government agencies involved in the implementation of EG pilot projects. Over the next five years, there are plans to connect around 4'000 agencies to GITN and to upgrade connections to 2 Mbps leased lines.

The federal government move to the new city of Putrajaya in the Multimedia Super Corridor has allowed a sophisticated ICT infrastructure to be created from scratch. Government agencies benefit from a state-of-the-art Synchronous Digital Hierarchy (SDH) broadband network.

RM 2.6 billion was allocated for the procurement of ICT systems and applications for government during the 7<sup>th</sup> year plan period.

#### 4.1.2 Government as supplier

The government has two roles as an ICT-supplier. On the one hand it must



ensure that adequate infrastructure is available to citizens to be able to access ICT services and applications. At the same time, the government must develop ICT applications for online citizen access to public sector services.

The government, through the incumbent telecommunication operator, TMB, has been involved in guiding infrastructure rollout. TMB has historically aligned its goals with national development plans to ensure that government infrastructure targets are met. Government moves to liberalize the telecommunication industry have increased private investment in the sector and expanded access, particularly for mobile services. The government has also funded a number of targeted programs such as enhancing ICT access in schools and facilitated the purchase of personal computers.

The central government portal is the *Malaysia Civil Service Link* (MCSL, <[mcsl.mampu.gov.my](http://mcsl.mampu.gov.my)>), the entry point to all online government agencies. The bilingual site (Malay and English) lists federal as well as state and local government agencies with web sites. MCSL provides various levels of classification and daily news in an effort to be timely

and attract users. MAMPU provides design guidelines to promote consistency across public sector web sites. In addition, individual sites link back to the MCSL. Around half of Malaysia's government agencies have established web sites including all federal ministries.

Under the EG flagship application, the government is rolling out a number of online applications ("e-Services") for citizens and business. These will allow Malaysians to retrieve government information, book services (e.g., tennis court, meeting hall, etc.), pay bills and update their personal details in various databases. Current applications allow users to pay for their telephone, electricity and traffic fines online using credit and debit cards. Another application allows users to apply for and renew some government documents (e.g., drivers license). A number of e-services kiosks have been created for those who do not have access to the Internet.

### 4.1.3 The Multimedia Super Corridor

The Multimedia Super Corridor (MSC), managed by the Multimedia Development Corporation

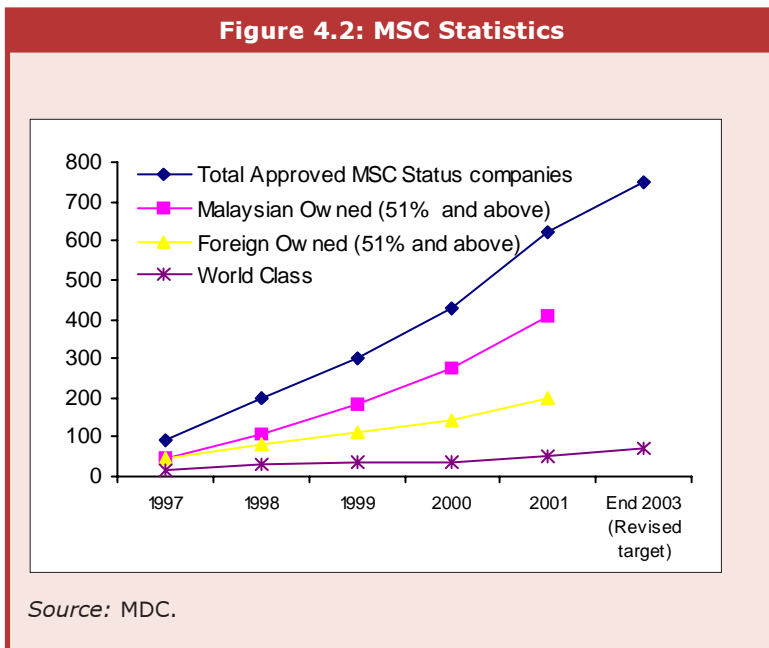
#### Box 4.1: SJ2005 - Malaysia's test e-city

While considerable attention and resources have been devoted to the creation of the Multimedia Super Corridor, the government is also curious about what impact ICT will have on existing Malaysian communities. This curiosity is being formalized in a dual approach in Subang Jaya, a residential township of around 400'000 inhabitants not far from Kuala Lumpur. Subang Jaya will serve as a test bed for becoming an e-city as well as studied for what changes ICT bring. The project has been dubbed SJ2005, the date by which a number of milestones are due.<sup>38</sup> This includes the ambitious goal of 100 per cent household Internet connectivity. In addition, a study is to be completed analyzing the impact of Subang Jaya's migration to the e-World.

SJ2005 is a tripartite collaboration between the NITC, the Subang Jaya Municipal Council (whose web site <[www.mpsj.gov.my](http://www.mpsj.gov.my)> won an award for the best national language site) and the Ministry of

Housing and Local Government. The project has both a top down and bottom up approach. The top down comes from a steering committee responsible for the overall project whereas the bottom up comes from local groups composed of Subang Jaya residents.

Rather than debating the merits of broadband access, residents concerns are more mundane such as crime and taxes. The interesting aspect is how the Internet is being used to address these issues. Subang Jaya has set up its own web site <[www.usj.com.my](http://www.usj.com.my)> used to disseminate information about the township. It provides a directory of local business, maps and bulletin boards on various topical issues. One of the most relevant services for citizens has been the Neighbourhood Watch that posts crime alerts. Another use of the Internet has been to establish a housing database that helped achieve a reduction in property taxes.<sup>39</sup>



(MDC <[www.mdc.com.my](http://www.mdc.com.my)>), is a major project designed to act as a catalyst for ICT industries and products by attracting and nurturing hi-tech companies (see Box 4.2). The MSC is located on a dedicated compound south of Kuala Lumpur. Telekom Malaysia has equipped the MSC with a state of the art network broadband network. Public efforts in support of the MSC include fiscal incentives for setting up ICT companies, building the infrastructure and developing the intelligent cities of Putrajaya and Cyberjaya. Companies can apply for MSC status if they are heavy users or providers of multimedia products, employ a substantial number of knowledge workers, and are able to transfer technology to Malaysia. Companies with MSC status receive additional privileges and taxation relief. By the end of 31st December 2001, there were 631 approved MSC companies and 50 world-class companies. The number of world-class companies was reached one year ahead of schedule. This success prompted an

upward revision of targets to 750 approved MSC companies including 70 world-class companies (see Figure 4.2).

In its role of this catalyst for ICT development throughout Malaysia, the MSC has established six flagship projects:

- Electronic government
- Multipurpose card
- Smart schools
- Telehealth
- R&D clusters
- E-Business

A new flagship application was introduced in November 2001, the Technopreneur Development Flagship, which is meant to accelerate the growth of home-grown technopreneurs.

### Box 4.2: Multimedia Malaysia

It seems that practically anything in Malaysia to do with Information and Communication Technology (ICT) uses the word multimedia. For example, the ICT policy-maker is the Ministry of Energy, Communications and Multimedia; the Malaysia Communications and Multimedia Commission (MCMC) refers to the industry regulator; the Multimedia Super Corridor (MSC) is the country's answer to Silicon Valley; and the Multimedia University is the nation's ICT institute of higher education. This could easily be construed as over-hype, particularly as many governments are paying lip service to the Internet age but rarely back their public proclamations up with concrete actions. However something appears to be going on in Malaysia in its embrace of ICT as a lever to lift it to developed country status by the year 2020 (its so-called Vision 2020).

The nation has an ambitious project to create a Malaysian "Silicon Valley." Launched in 1996, the Multimedia Super Corridor (MSC) will stretch south from the largest city, Kuala Lumpur (KL), all the way to the new Kuala Lumpur International Airport (KLIA). The MSC is arising from a 15 kilometre long by 50 kilometre wide strip of land carved from a former palm tree plantation.<sup>40</sup> KLIA, completed in 1998, is futuristic, glass-enclosed and surrounded by rain forest—maybe the world's first eco-airport. So far, only one phase has been completed. There are plans for two more terminals as demand rises. In fitting with its location at the tip of the MSC, the airport is so computerized that supposedly sales and inventory levels of all the shops it contains can be calculated within a day.

In addition to the airport, other landmarks include the Petronas Twin Towers (the world's tallest twin towers) in southern KL, and the 'intelligent cities' of Putrajaya—the seat of the new federal government hosting government ministries and the Prime Minister's residence—and Cyberjaya—the main town of the MSC.

The vision for the MSC is to create an oasis for Information Technology companies that will make Malaysia a multimedia hub and propel it into the hi-tech age. The government is providing a range of incentives to attract companies to the MSC. Over 600 companies had achieved the coveted MSC status.<sup>41</sup> Some 100 international companies including well-known heavyweights as Alcatel, Cable & Wireless, Ericsson, Fujitsu, IBM, Intel, Lotus, Lucent, Nokia, NTT, Oracle, Siemens and Sun have committed to the scheme. Several of them are in the midst of constructing their own facilities in Cyberjaya. The earliest one to have accomplished this is Japan's NTT. Its MSC facility is NTT's 2<sup>nd</sup> largest overseas Research and Development centre. Several multinational companies have also

set up their Asia Pacific Regional Data Centers in the MSC. In fact, one such Fortune Top 10 company has located a Global Data and Support Center right in Cyberjaya, one of the company's 3 locations worldwide.

Telekom Malaysia has completed installing the MSC communications infrastructure. The Asynchronous Transfer Mode (ATM) backbone has a 40 Gbps switch capacity. A variety of broadband customer access technologies will be offered including Fibre-to-the-Home, ADSL and high-speed wireless. Rapid national and international connectivity is assured through a 622 Mbps link to Telekom Malaysia's domestic backbone and over 300 Mbps to the Internet backbone. Telekom Malaysia will guarantee quality of service, offer globally competitive tariffs and provide various complementary services such as web hosting.

Located at the centre of the MSC in Cyberjaya, the Multimedia University (MMU) is the first of its kind in the world. Focusing exclusively on a high-tech curriculum, the campus was built in 19 months and accepted its first students in 1997. There is also a sister campus in the city of Melaka. The two units already have some 10'000 students with a planned enrolment of 12'000 by 2002. There is a strong international flavour with students from 31 countries and faculty representing 23 nations. Students can enrol for undergraduate degrees in traditional subjects such as Electronics, Information Technology, Software Development, Data Communications and Engineering as well as more esoteric areas such as Entrepreneurship, Digital Media and Digital Art. And, in keeping with Malaysian fondness for the word, there is a Bachelors Degree in Multimedia. It is envisioned that MMU will play the same role that Stanford University does for Silicon Valley: a breeding ground for high-tech research and a steady supply of skilled techies for MSC businesses.

What sets the MSC apart from similar schemes in other countries is its planning and scale. While other nations can boast of high-tech agglomerations such as Silicon Valley in the USA or Bangalore in Southern India, these grew piece mill, without much initial government support. In contrast, the MSC is the brainchild of the Malaysian government—which is offering numerous incentives for companies to settle there—and is underpinned by a three-phase plan spanning some twenty years. While many other governments are developing so-called technology parks, they pale in comparison to the size and scope of MSC.

MSC is the creation of a first-world environment in a developing country. In many ways, Malaysia is probably one of the few countries where this could

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### Box 4.2: Multimedia Malaysia (Cont'd)

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happen. It is a unique developing nation with an unusual set of circumstances. Malaysia's per capita income of some US\$ 3'000 straddles it somewhere between the first and third. It is not quite as rich as Asian tigers such as Singapore, Hong Kong SAR, South Korea or Taiwan but neither is it as poor as other South East Asian developing nations such as Indonesia, Thailand or the Philippines. Nor is the government as cash-strapped as a typical developing country. Unlike advanced developed countries, where governments seemed to be ailing from sclerosis, the Malaysian government retains the lead role in driving economic development.

There are a number of programs to assist budding dot-coms. These include R&D grants, incubation, training and venture capital financing. One hope is that world-renowned high tech companies will rub shoulders with Malaysia companies. This will help sharpen the skills of so-called Malaysian "technopreneurs." Success should breed more success: as the number of companies grows, others will feel they cannot afford to be left out. It is hoped that international companies will establish their Asian headquarters at MSC, one reason for the closeness of the airport. In order to attract them,

there will be wide-open spaces, efficient transportation options, and environmentally-friendly, high-tech housing—in short, first world living.

Huge investments have been made with the heavily fibered enterprise buildings, residential apartments and neatly terraced houses equipped with broadband infrastructure and services, all linked to the City Command Center. Recreational and commercial areas are now the focus of the intense construction work. The gut instinct is that there is something special going on here. The strong government leadership and dynamism of the Malaysian population suggest that this is going to work. Even at this early stage, the dedication and enthusiasm surrounding the project are infectious and leave many, particularly those from developing countries, in awe. After all, for someone from Nigeria or Jamaica, Silicon Valley seems irrelevant; a developed country phenomenon they just cannot relate to. However, to see a fellow developing country build a high tech hub out of a tropical jungle sinks in. Indeed one emphasis of the MSC is to be a test-bed for appropriate, low-cost communications technologies suitable for developing countries.

## 4.2 Education

### 4.2.1 The Ministry of Education

In 2001, the Ministry of Education (MOE) <[www.moe.gov.my](http://www.moe.gov.my)> had a RM 13 billion (US\$ 3.4 billion) budget, which represents some 20 per cent of the total government spending. The fact that the MOE receives the largest share of the budget illustrates the government's commitment to the educational sector. The MOE itself has some Intranet applications, such as a personnel list, a directory and a teachers e-mail list. There is a ministry server in each state and some 900 employees out of 2'000 have their own e-mail account. The MOE currently has a PC to employee ratio of roughly 1:2 and it is hoping to provide every employee with a PC by the year 2005.

### 4.2.2 Primary and secondary education

Malaysia has 7'217 primary schools and 1'641 secondary schools. Children start school at the age of six or seven and secondary schools are for 13 to 17 year olds. As Table 4.2 shows, 31 per cent of primary and 54 per cent of secondary schools had PC facilities in 2000 and ten per cent of primary and 34 per cent of secondary schools had Internet access. The uneven distribution of Internet services across Malaysia is reflected in the educational sector. There is a national digital divide with one hundred per cent Internet connectivity of schools within the Klang Valley (the region around Kuala Lumpur) while few schools in rural areas have Internet access. It is estimated that some 1'000 schools, around 12 per cent, are without a telephone line.

**Table 4.2: Malaysia at school**

Number of primary and secondary schools, students, teachers, and access to ICT, 2000

	Institutions	Students	Number of schools with PC	Number of schools with Internet	Teachers
Total	8'858	4'665'182	3'085	1298	247204
Primary Schools	7'217	2'870'667	2202	739	150'681
Lower and Upper Secondary Schools	1'641	1'794'515	883	559	96'523

Source: INFOSOC Malaysia, "Discussion paper on Access and Equity: Benchmarking for progress."

The MOE has earmarked RM 4.2 billion, that is one third of its annual budget, to connect another 230 rural schools to the Internet in the near future. 120 will be connected with ISDN lines, 100 with PSTN lines and ten with a VSAT connection. Another initiative is *Smart Schools*, one of the country's flagship projects (Box 4.3).

Since 1990 all teachers are obliged to take basic informatics courses in teachers' college and the MOE also offers intensive courses during the weekends and holidays for those who want to develop their IT skills.

There are an estimated 250 schools, primary as well as secondary, with their own web sites. On visiting some of these sites (such as <http://www.jaring.my/tkc/right.html>, or <http://www.homestead.com/skkpasirputeh/uji.html>) one notices not only the high quality of their presentation and organization but also the quality of content. Students and teachers work together to present their school, its history and its activities, as well as the pictures that go with it. Highly animated sites and flashing images invite you to listen to the school song, take part in online chat, post a message on the message board or send an e-mail to the headmaster. It is obvious that while part of Malaysia's youth has never used a PC, others have acquired skills well beyond the basics.

Those who have access to the Internet also have the possibility to expand or acquire knowledge online, through one of several educational portals (e.g., <[www.myetutor.com](http://www.myetutor.com)> or <[www.e-tuisyen.com](http://www.e-tuisyen.com)>). Following the MOE's curriculum, children have access to interactive multimedia tutorials and personalized learning programs through these portals. For a monthly subscription of RM 38 for primary courses and RM 48 for secondary courses, the portals offer an alternative and fun way to study.

### 4.2.3 Higher education

Computer networking within Malaysian higher educational institutions dates back to 1987 when the RangKoM network was established connecting four universities and MIMOS. Dial-up connections to the Internet via Australia were established in 1990 and a permanent connection in 1992. Today, all 14 public and 10 private universities are connected to the Internet via leased lines thus theoretically providing access for some half million students. Most of the universities around the country are also connected to Joint Advanced Research Integrated Network (Jaring) high-speed fibre optic backbone. Connections have also been established between some Malaysian and foreign institutions using Internet-2 through the Malaysian Advanced Network Integrated System (MANIS, <[www.manis.net](http://www.manis.net)>).

### 4.2.4 Distance learning

Several universities offer distance learning. Noteworthy is Unversiti Tun Abdul Razak (UNITAR, <[www.unitar.edu.my](http://www.unitar.edu.my)>). A virtual university, UNITAR offers online courses in subjects including information technology and business, and Bachelor, Master and Doctorate degrees. In 1998, UNITAR received its first 162 students and the number has grown to about 7'000 students in November 2001. The privately owned university offers courses through a combination of teaching methods, including face-to-face, online and multimedia.

In order to accommodate demand for higher education in public universities, the government launched a distance-learning program called the Multimedia Technology Enhancement Operations (METEOR). A consortium of 11 public universities, METEOR offers 25 courses in areas such ICT, law and business to some 20'000 students. In total, it is estimated that around 36'000 Malaysians were using distance learning in 2000 a figure projected to rise to 54'000 in 2005.<sup>42</sup>

### 4.2.5 Human resources

At the end of 1998, Malaysia had some 87'000 ICT workers of which some ten

#### Box 4.3: Smart schools, smarter buses

More than just a catchy label, the Smart School project demonstrates Malaysia's determination to prepare its society for the information era, from an early age. Like so many ICT-related initiatives, the Smart School project is closely linked to the Multimedia Super Corridor (MSC) and the need to form a knowledge-based and technologically literate generation of Malaysians. The 1997 pilot project, initiated by the Ministry of Education and the Multimedia Development Corporation, selected 90 schools from all over the country to 'go smart' by July 2002. Eventually, by the year 2010, all of Malaysia's primary and secondary schools are supposed to have transformed to Smart Schools. The Ministry of Education is also encouraging schools to 'go smart' on their own initiative. While the Ministry provides the necessary know how and guidelines, the transition is financed either by private companies or fund raising initiatives. The MSC, for example, has adopted several schools on their way to obtain the Smart School status (see Box 4.4).

What exactly makes a school Smart? One critical component is the introduction of ICT. All Smart Schools will have at least a computer lab for students to share. Special classes and applications will help students to become ICT literate. Smart Schools also need smart teachers. Teachers must attend a special (and highly popular) 14-week training session, organized by the Ministry of Education.

The project is not simply about technology. It is also about "reinventing the education system", mainly by changing teaching and learning methods and by using

technology as a tool for acquiring knowledge. A smart school curriculum, for example, will include an international language, mainly English, and multimedia technology to help children learn the language.

Some rural schools that do not benefit from any of the government initiated IT programs, may have access to ICT through one of the three 'Smart Buses'.

The Mobile Internet Unit (MIU) is a kind of 'cybercafé on wheels' that drives to non-mainstream schools to conduct basic ICT courses. These smart buses are made-to-fit the often rough conditions of the places they visit, for example, through the special shock absorber system. For locations without electricity, the bus is equipped with a generator. The electronic classroom, which visits some 20 schools a year for a day each, teaches students basic computer

and Internet skills. Should it be impossible to connect to the Internet because the school lacks a telephone line, teachers use cached Internet sites to demonstrate the usefulness and possibilities of the world wide web. The buses drive off at the end of the day but they leave behind at least one PC and a PSTN connection to the Internet, if possible. The price for the visit is educational— students are asked to create their own web site.

A similar project is planned by the Universiti Malaysia Sarawak (Unimas) in Eastern Malaysia. Instead of a cybercafé on wheels, this one will be floating. The Internet Mobile Boat seeks to bring ICT to schoolchildren along the Rejang River in Sarawak.<sup>44</sup>





### Box 4.4: The Dengkil school

The private sector is being harnessed to contribute to the wiring of Malaysia's public schools. The Dengkil Secondary School, for example, has been converted into a model Smart School by a private sector initiative led by the Multimedia Development Corporation (MDC). It is one of two rural schools in the Dengkil area (close to Kuala Lumpur) sponsored by the MDC and other companies. Before the private sector project was launched in 1998, "some of the teachers and students were scared to even touch a PC," says one of the IT trainers. Since then things have changed. Today the school is equipped with a 22 PC computer lab, 2 servers and 4 printers, as well as an Internet connection. The sponsors have also organized IT training courses for students and staff. Although



all of the 76 teachers are IT literate and anyone can use the computer lab, it is impossible to give intensive training to all of the 1'400 students. About 40 of them have signed up for the computer club that meets for a couple of hours a week. Others come in on the weekends to take a course on the basics of networking. The teachers responsible for the networking course received their training through the United Nations Institute for Training and Research (UNITAR) and books and manuals were provided by 3Com.

*Dengkil Secondary School students are eager to become IT literate. A private sector initiative led by the MDC has provided their school with a computer lab and Internet access.*

per cent worked as software engineers.<sup>43</sup> It is estimated that an additional 85'000 ICT workers will be needed by 2005. Increasing government efforts as well as private sector initiatives exist to raise the number of skilled workers. In 2000, some 65'000 students were taking ICT courses at institutes of higher learning. Another 750 people participated in IT-related courses at one of the country's 20 Industrial Training Institutes (ITI).

Malaysia's first university to specialize entirely in ICT was founded by Telekom Malaysia in 1998. Formerly known as the Universiti Telekom, the Multimedia University (MMU, <[www.mmu.edu.my](http://www.mmu.edu.my)>) has two campuses, one located in Cyberjaya, in the heart of the Multimedia Super Corridor (MSC), and the other in Melaka. It is anticipated that the MMU will help provide a significant part of the work force needs of the MSC, estimated at around 12'000 through the year 2005. MMU currently has some 10'000 students and has already graduated 500.

A variety of training projects have been launched by the government as well as by the business sector to develop ICT skills. In-house training is one of the ways the government tries to cope with the lack of ICT experts. Specialized courses on web

page design and other ICT applications are provided in various government departments and agencies.<sup>45</sup> Other projects include the National Internet Literacy Campaign organized by the Small and Medium Industries (SMI) Association of Malaysia to help SMIs make use of the benefits of the Internet.<sup>46</sup> The Human Resources Ministry is conducting ICT training sessions. The goal is to train some 60'000 workers as well as 5'000 people, including housewives and students in each of the country's states. Free computer courses were made possible through the donation of 1'000 PCs by private firms.<sup>47</sup> The Human Resources Development Council has provided funding for companies to purchase computers and computer based training software.

### 4.3 Health

#### 4.3.1 The Ministry of Health

In 1998, the Ministry of Health (MOH, at <[www.moh.gov.my](http://www.moh.gov.my)>) had a budget of RM 4.2 billion (US\$ 1.1 billion), some 6.6 per cent of the national budget. The Ministry employs around 1'100 employees and has a computer to employee ratio of 1:3. While officers and management staff each have their own PC, the support staff has a PC ratio of 1:5.

**4.3.2 Online information**

The MOH’s annual *Health Facts* publication provides a detailed overview and data on health related topics. The Ministry also publishes a variety of these statistics on its web site (see Table 4.3). The web site is a good source of information and includes useful online applications. Browsers to the site can find out about first aid and get advice on what to do in case of a burn or snakebite. Users can send messages to the MOH who, in an annual survey, evaluate and discuss comments concerning the quality of health care, the availability of services and criticism regarding doctors and health care institutions. The MOH web site also provides advice for doctors and hospitals on medical laws and policies and how to obtain a license or how to register.<sup>48</sup>

**4.3.3 Hospitals**

Most government hospitals have access to the Internet, some through a dial-up connection, others through a leased line. E-procurement of medical products does not yet exist. The fact that every hospital has its own in-house pharmacy makes online purchasing of drugs less interesting. Each of Malaysia’s 136 districts has a health centre that provides basic health services. These clinics have PCs but not many have Internet access and the PC is mainly used for administrative purposes.

Four hospitals have a complete ICT system, which means that all medical records are computerized and a profile of each patient is available to doctors. The information on the patient is stored in a databank, which can be accessed through the Internet. The plan is eventually to extend this system to all patients in all hospitals. Called the ‘*pioneer multimedia hospital*’, Hospital Selayang <[www.selayanghospital.gov.my](http://www.selayanghospital.gov.my)> is fully computerized. Located 15 kilometres from Kuala Lumpur, the 960-bed government hospital is Malaysia’s most modern medical institution. Apart from the latest telemedicine facilities, it is equipped with 1’200 PCs, 67 servers,

**Table 4.3: Malaysia Health Facts**

Vital statistics, 1998

Number of government hospitals	111
Number of private hospitals	2’063
Number of health centres	772
Number of rural clinics	1’992
Number of mobile clinics	208
Number of public doctors	8’555
Number of private doctors	6’461
Doctor to population ratio	1:1’477

*Source:* Ministry of Health, Malaysia: [www.moh.gov.my/Facts/2000.htm](http://www.moh.gov.my/Facts/2000.htm).

300 printers, 130 bar code readers and an ATM back bone.

**4.3.3 Telehealth**

The *Telehealth* project, one of the MSC flagships, is officially managed by the MOH. Most of its application development is outsourced. The project’s goal is to improve the country’s overall accessibility and quality of healthcare through ICT. The Telemedicine Act passed in 1997 provides a legal framework for the Telehealth project by regulating the use of telemedicine. The Telehealth initiative consists of four pilot applications:

- The **Mass Customised Personalised Health Information and Education** (MCPHIE, <[www.mcphie.com.my](http://www.mcphie.com.my)>) application disseminates information in the form of databases and educational material. MCPHIE has been in operation since 1999 and already provides information in various forms, such as through its online health dictionary or its ‘Healthy lifestyle’ campaign.
- The **Continuing Medical Education** (CME, <[www2.telehealth.com.my/NASApp/thecme/cme\\_main.jsp](http://www2.telehealth.com.my/NASApp/thecme/cme_main.jsp)>)



application seeks to expand the skills of healthcare providers using multimedia and information technologies. It includes a virtual library and distance learning programs.

- The **TeleConsultation** <[www.worldcare.com.my/telehealth/index.html](http://www.worldcare.com.my/telehealth/index.html)> application brings healthcare providers together by using the Internet as a means of communication and information exchange.
- The **Lifetime Health Plan's** objective is to set up a personalized health plan for each individual, taking into consideration the person's health record.

All four Telehealth components are expected to be fully operational by the year 2006.

### 4.4 E-business

Electronic commerce (e-commerce) in Malaysia grew sharply in 2000. Revenue was estimated at RM 1.6 billion (US\$ 425 million), up some 600 per cent over the previous year. Malaysian e-commerce is forecast to reach RM 11.4 billion (US\$ 3 billion) by 2004, an annual average growth of over 60 per cent.

E-commerce is receiving a lot of attention and there have been a number of initiatives to get it rolling. These include the creation of a government task force, passage of digital laws, and work on payment systems.

The government created the National E-Commerce Committee (NECC) to coordinate policies and activities in this area. In November 1998, the NECC announced its e-commerce framework. It identified three guiding principles: a partnership between government, business and community; recognizing the borderless and global nature of e-commerce; and creating opportunities for all Malaysians to benefit from e-commerce. NECC also iterated four strategic thrusts: 1)

building trust and confidence; 2) enhancing the legal and regulatory framework; 3) strengthening infrastructure and logistical support; and 4) optimising economic and social benefits.

The Digital Signature Act of 1997 recognizes electronic documents as legally binding. It led to the creation of a Controller of Certification Authority in October 1998. Two Certification Authorities have been licensed, Digicert and Cybersign. They are responsible for authenticating online transactions. The Copyright Act of 1997 made it illegal to transport copyrighted works over the Internet. The country has also been more active in enforcing software protection with piracy rates declining from 77 per cent in 1995 to 71 per cent in 1999.

One study reported that five per cent of Malaysian Internet users had made an online purchase in 2000, ranking Malaysia 17<sup>th</sup> among 27 countries studied.<sup>49</sup> There are a number of efforts to enhance payment methods to encourage more Malaysians to shop online. The central bank (Bank Negara) authorized the Malaysian Electronic Payments System (MEPS) <[www.meps.com.my](http://www.meps.com.my)> to build an electronic payment system. Owned by 27 Malaysian financial institutions, MEPS has developed a system using the Secured Electronic Transaction (SET) protocol. Nine banks were using its SET Payment Gateway at December 2001.

The number of credit cards in Malaysia has increased 2.6 times since 1992 to some 2.3 million by the end of 2000. This figure is roughly equivalent to half the households in Malaysia. Thus, it appears that a lack of credit card ownership is not yet an inhibiting factor in online payment. One development has been the issuance of 'virtual' credit cards by some of the nation's banks.<sup>50</sup> These 'invisible' credit cards are being issued to promote online shopping. Another project is the National Multi-Purpose card flagship, which will support credit, debit, ATM and virtual cash functions. This card will eventually be distributed to all Malaysian adults.

The readiness of Malaysian companies to pursue e-commerce varies. Two surveys were conducted in 1999 to access the e-readiness of Small and Medium Enterprises (SMEs) as well as larger companies.<sup>51</sup> For the 800 SMEs surveyed, while some 90 per cent had computers, just over half had Internet access and less than 20 per cent had a web site. For the 385 larger companies interviewed (at least

150 employees and annual revenues of at least RM 25 million) the figures were higher. All had computers, 86 per cent had access to the Internet and some 44 per cent had a web site. However, in both cases, Internet-based transactions were low. For example, less than five per cent of Malaysian companies had implemented Internet payment systems in 1999.

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<sup>37</sup> Economic Planning Unit. *The Eighth Malaysia Plan 2001-2005*. <[www.epu.jpm.my/RM8/front\\_RM8.html](http://www.epu.jpm.my/RM8/front_RM8.html)>.

<sup>38</sup> <http://www.nitc.org.my/projects/index.html>.

<sup>39</sup> Hooi You Ching. "Bringing Communities Closer." *The Star*. 17 October 2000. <http://www.usj.com.my/news/thestar001017/usj-001017a.php3>.

<sup>40</sup> Malaysia is the world's largest exporter of Palm Oil. In 1999, it produced 10.6 million tonnes of the product; export value was RM 19.5 billion. Source: Department of Statistics. "Key Statistics-Malaysia." <[www.statistics.gov.my/English/keystats.html](http://www.statistics.gov.my/English/keystats.html)>.

<sup>41</sup> MSC status is conferred by the Multimedia Development Corporation, established to oversee the development of MSC. MSC-Status allows companies to benefit from a number of government initiatives including unrestricted employment of local and foreign workers, exception from foreign investment limits, 10 year tax holiday and no import duties.

<sup>42</sup> "Education to boost k-economy." *The Star*. 22 April 2001.

<sup>43</sup> "Information Technology." Economic Planning Unit. *The Eighth Malaysia Plan 2001-2005*. <[www.epu.jpm.my/RM8/front\\_RM8.html](http://www.epu.jpm.my/RM8/front_RM8.html)>.

<sup>44</sup> "Malaysian Internet boat surfs into Borneo." *CNN.com*. 6 December 2000. <http://www.cnn.com/2000/TECH/computing/12/06/malaysia.reut/index.html>.

<sup>45</sup> "Malaysia: Study to rate IT skills of civil servants." *New Straits Times*. 19 March 2001.

<sup>46</sup> Wendy Lee. "Campaign to double SMI Net literacy level kicks off." *CNET.com*. 28 November 2000.

<sup>47</sup> "Weekend training to enhance IT literacy." *Business Times (Malaysia)*. 15 March 2001.

<sup>48</sup> Apart from the MOH's web site, other health-related portals include *The Malaysian Medical Resources* <[mymed.cjb.net](http://mymed.cjb.net)> or *TM Health Online* <[www.health.com.my](http://www.health.com.my)>. The pharmaceutical company Guardian (<http://www.guardian.com.my>) also provides online information on a variety of health and medical issues.

<sup>49</sup> Malcom Rosario. "Online shopping sees growing trend here." *Business Times*. 9 August 2000. <http://adtimes.nstp.com.my/archive/aug9f.htm>.

<sup>50</sup> See "Citibank expects 35'000 to use its virtual credit card." *CNET*. 7 December 2000. <http://asia.cnet.com/newstech/communications/0,39001141,13030615,00.htm> and Sreejit Pillai. "MBF Cards launches "Net-savvy" credit card." *CNET*. 22 February 2001. <http://asia.cnet.com/newstech/communications/0,39001141,13031492,00.htm>.

<sup>51</sup> MSC Technology Centre. *The Electronic Commerce Strategic Directions for Malaysia*.

## 5. Conclusions

### 5.1 State of the Internet in Malaysia

The Mosaic Group <[www.agsd.com/gdi97/gdi97.html](http://www.agsd.com/gdi97/gdi97.html)>, has developed a framework for characterizing the state of the Internet in a nation. They consider six dimensions, each of which has five ordinal values ranging from zero (non-existent) to four (highly developed). The dimensions are as follow:

- **pervasiveness:** a measure based on users per capita and the degree to which non-technicians are using the Internet.
- **geographic dispersion:** a measure of the concentration of the Internet within a nation, from none or a single city to nationwide availability.
- **sectoral absorption:** a measure of the degree of utilization of the Internet in the

education, commercial, health care and public sectors.

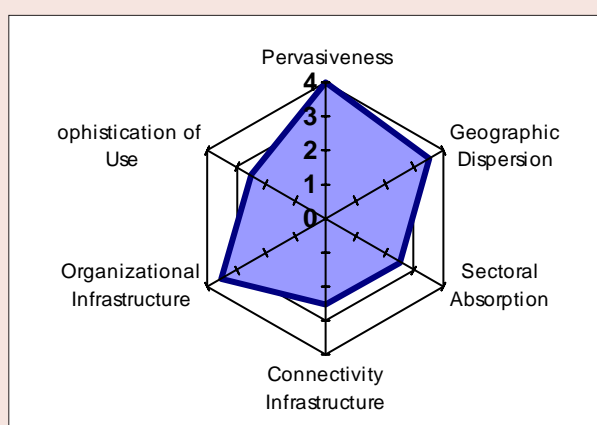
- **connectivity infrastructure:** a measure based on international and intranational backbone bandwidth, exchange points, and last-mile access methods.
- **organizational infrastructure:** a measure based on the state of the ISP industry and market conditions.
- **sophistication of use:** a measure characterizing usage from conventional to highly sophisticated and driving innovation.

Malaysian values for these dimensions are shown in Figure 5.1.

**Pervasiveness** is rated at level 4, *Pervasive*. At December 2000, there were approximately 1.2 million Internet subscribers in the country

Figure 5.1: State of the Internet in Malaysia

Dimension	Value
Pervasiveness	4
Geographic Dispersion	3.5
Sectoral Absorption	2.5
Connectivity Infrastructure	2.5
Organizational Infrastructure	3.5
Sophistication of Use	2.5
<b>TOTAL</b>	<b>18.5</b>



Note: The higher the value, the better. 0 = lowest, 4 = highest.  
Source: ITU.

translating to an estimated four million users, or 17.2 per cent of the population.

**Geographic Dispersion** is rated at level 3.5, between *Highly dispersed* and *Nationwide*. Internet access is available from all state capitals. Nationwide dial-up access is available via a four-digit telephone number at a standard tariff of 2.5 sen (0.66 US cent) per minute. The main constraint to nationwide connectivity is local access since not all households, particularly in rural areas, have a telephone.

**Sectoral Absorption** is rated at level 2.5, between *Moderate* and *Common*. This ranking is a function of the type of connectivity in education, government, health care and business. There is a relatively high connectivity at the university level and initiatives for connecting primary and secondary schools (of which around 1'300 out of some 8'900 have Internet access). All ministries and a growing number of state governments are on the web and accessible through the *Malaysian Civil Service Link* portal <[mcsli.mampu.gov.my](http://mcsli.mampu.gov.my)>. Most hospitals are connected to the Internet via leased line. In 1999, less than 20 per cent of Small and Medium Enterprises (SMEs) had a web site while the corresponding figure for larger companies was 44 per cent.

The **Connectivity Infrastructure** is rated at level 2.5, between *Expanded* and *Broad*. International connectivity of the largest ISP is over 350 Mbps and it offers a domestic backbone of 155 Mbps. In addition, the other ISPs have varying levels of international connectivity and domestic fibre and microwave backbones. Peering is only between the two largest ISPs. High-speed local access is limited with leased line and ISDN being the main access methods. ADSL is being tested while cable modem access does not exist.

The **Organizational Infrastructure** is at level 3.5, between *Competitive* and *Robust*. There were seven ISPs at the end of 2000. There is legally

no limit on the number of licenses that can be granted to provide Internet access service. However, the transition to a new licensing scheme where infrastructure provision is separated from service provision, means that ISPs would also need to have a network license to build their own infrastructure. The market is dominated by the two leading ISPs; their allegedly below cost tariffs make it uneconomical for other ISPs to compete in the dial-up market.

**Sophistication of Use** is at level 2.5, between *Conventional* and *Transforming*. The most popular applications among most users appear to be e-mail and information retrieval. Because many users are English speaking, much of Malaysia's Internet access is to web sites abroad. There are a number of government-led initiatives to develop applications that hold the potential of transforming the way people and businesses use the Internet. These include flagship applications being developed in the Multimedia Super Corridor as well as e-government.

## 5.2 Recommendations

Malaysia has reached an enviable level of ICT development considering its per capita income. At the end of 2000, Malaysia ranked 30<sup>th</sup> in the world in Internet penetration, above several more developed nations. The Malaysian government has created a number of institutions and programs to accelerate ICT use within the country. In many ways, Malaysia's proactive approach to ICT is unique and provides an interesting example for the rest of the world. This includes the creation of the Multimedia Super Corridor (MSC), the establishment of a technologically neutral and converged industry regulator, trend setting research in ICT access and equity and the application of ICT to evolve into a knowledge-based society. The government's strong ICT thrust and novel approach are to be applauded and encouraged.

With the government so involved in encouraging ICT, the nature of the recommendations for enhancing ICT

development is different than other countries. Perhaps they would have more to do with allowing a grass root, bottom up approach to develop in conjunction with the obvious top down one. As the framework analysis above illustrates, Malaysia is strong in the pervasiveness, geographical dispersion and organizational setting for ICT. Its weaknesses are in the absorption, connectivity infrastructure and sophistication of use. Thus recommendations mainly address these areas.

The country also faces three dilemmas at the present time. One is the trade-off between devoting resources to the MSC at the expense of ICT development in the rest of the country. The second is reconciling inexpensive—and allegedly below cost—dial-up Internet access with a need to rebalance rates. The third is a low level of broadband access.

### 5.2.1 Broadband blues

Despite all the government encouragement for using ICT to convert Malaysia into a multimedia-based knowledge society, the nation is seriously behind in broadband access. According to one report, Malaysia ranks last among 13 Asia-Pacific countries in the percentage of broadband Internet subscribers.<sup>52</sup> This is a grave weakness since many of the decisive benefits and much of the sophistication of ICT are only available through broadband access.

The government might consider a crash programme to accelerate broadband penetration. This could have both *supply* and *demand* components. On the supply side, measures to increase broadband access would include incentives for the incumbent operator TMB to facilitate the unbundling of its local telephone lines. The government could also examine the practicality of broadband access via Local Area Networking in high-density areas such as apartment buildings. Another supply option is to encourage the rapid development of high-speed fixed wireless access through accelerated license and

spectrum awards. A related issue is the lack of a public Internet exchange. Efforts should be made to promote public peering among ISPs at a high speed Internet exchange. The promotion of local peering amongst ISPs has already been incorporated in the Framework for Industry Development (FID) issued by the MCMC.

On the demand side, there is a need to come up with interesting applications that require broadband access. Here the government might provide incentives for the development of slick multimedia content. There could also be a push to set up broadband access points in community centres and other public locations to give citizens a taste of fast speed and hopefully get them hooked on it.

### 5.2.2 Avalanche of initiatives

There are numerous government organizations involved in promoting the nation's ICT development as well as a number of plans, concepts and projects. Sometimes it is difficult understanding who is responsible for what. There also appear to be some overlapping areas. A better understanding of the government's ICT players and activities is needed. One possibility might be the creation of a web site that regroups all of the various agencies and initiatives with a clear explanation of how they all fit together.

### 5.2.3 Accelerate application development

Although there are some potential users who are not using the Internet because they lack computer literacy, there are others who do not see any benefit. Attracting these people to the Internet will require interesting applications that makes them want to use it. This suggests that existing applications and content are insufficient. Most of these people are probably in rural areas. Recommendations here would include analysing the information requirements of non-users to find out how the Internet could improve their

lives. Another recommendation is the acceleration of e-government applications particularly for forms-based activities such as tax payment, licenses (e.g., marriage, business, etc.) that would drive people to the Internet because of the time savings.

### 5.2.4 The rebalancing dilemma

According to its Framework for Industry Development (FID), the Malaysian Communications and Multimedia Commission (MCMC) will review regulated rates in 2002 with the guideline of moving towards 'market-driven' rates. This seems to be part of a rebalancing exercise where long distance call rates will be lowered and local call rates raised. This has serious implications for dial-up Internet access. If local call rates are raised and there is no exemption for Internet access rates, then Internet usage will become more expensive. Malaysia should continue its precedent-setting policy of providing a lower rate for Internet access and should consider keeping the same rate or even lowering it. Furthermore, raising telephone line rental rates will also work against higher rates of household Internet access. Thus, any rebalancing exercise needs to factor in the impact on Internet access and not solely consider the impact on enhancing local loop penetration.

### 5.2.5 Industry information

One area that has been a weakness for Malaysia is demand side information about its ICT sector. For example, there are no precise figures on the number of households with a telephone let alone a computer or Internet subscription. A lack of detailed and relevant information adversely affects implementation of the nation's many fine policy initiatives as well as analysis of their impact. Steps have recently been introduced to remedy the situation. In 2001, the MCMC began providing a minimal set of ICT indicators on its web site (number of telephone lines, mobile subscribers and Internet subscribers). The Department of Statistics also for

**Figure 5.2: How many Multimedia households?**

Are the following items available for use by members of this Household:

- Radio / Hi-fi
- Television
- Video / VCD / DVD
- Fixed Telephone Line
- Mobile phone
- Personal Computer (PC)
- Internet Subscription

Source: Question B7. Population and Housing Census Malaysia 2000

the first time included questions about availability of ICT equipment in households in the 2000 Census (see Figure 5.2). When the results are released, they will provide the first comprehensive portrait of ICT access in the nation. These initiatives need to be expanded and carried out on at least an annual basis. One analytical shortcoming is user information. There are currently no regular, publicly available, methodologically consistent surveys on users and usage of ICT. These types of surveys would not only seek to find out how many and the type of ICT user but also how they are using ICT. They would also seek to determine respondents sentiments regarding what the problems and barriers are to ICT usage. Government agencies in Singapore and Thailand carry out these types of surveys on an annual basis which could serve as models.<sup>53</sup> It is recommended that the MCMC and Department of Statistics collaborate to produce an annual survey of ICT usage in the nation.

### 5.2.6 Marketing Malaysia

Malaysia has developed many unique strategies for enhancing ICT. These include projects such as the MSC and the flagship applications, programmes for reducing the Digital Divide such as putting Internet access in schools and designing a universal service policy as well as its innovative approach to third

generation mobile licensing. Many of these ideas would be relevant to other developing countries. Malaysia might want to consider how it could work with regional and international organizations to disseminate some of these exciting developments to other developing countries.

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<sup>52</sup> N. Ismail. "Open 'last mile' to boost M'asia broadband." *CNETAsia*. 30 November 2001. <http://asia.cnet.com/newstech/communications/0,39001141,39003530,00.htm>.

<sup>53</sup> Reference to Singapore and Thailand Internet surveys.

### Annex 1: List of meetings

Number	Date	Time	Organisation
1.	02/04/2001	9.00am – 10.00am	CMC <sup>1</sup> – Regulatory Overview
2.	02/04/2001	10.00 – 10.45am	CMC - Licensing
3.	02/04/2001	10.45 – 11.15am	CMC - Competition and Access
4.	02/04/2001	11.15 – 11.45am	CMC - Content
5.	02/04/2001	11.45 – 12.30pm	CMC – Technical Regulation
6.	02/04/2001	2.00 – 3.00pm	Telekom Malaysia (Including TMMNet and TM) MSC Operations)
7.	02/04/2001	3.00 – 4.00pm	
8.	02/04/2001	4.00 – 5.00pm	Maxis (including Maxis.net)
9.	02/04/2001	5.00 – 6.00pm	Pikom
10.	03/04/2001	9.00 – 10.00am	Ministry of Energy, Communications and Multimedia
11.	03/04/2001	10.30 – 12.00 noon	Ministry of Education
12.	03/04/2001	2.00 – 3.00pm	DiGi
13.	03/04/2001	3.00 – 4.00pm	Celcom (& celcom.net)
14.	03/04/2001	4.00 – 5.00pm	MegaTV
15.	03/04/2001	5.00 – 6.00pm	MEASAT Broadcasting (Astro)
16.	04/04/2001	8.30 – 9.30am	Department of Statistics, Malaysia
17.	04/04/2001	10.00 – 11.00am	Economic Planning Unit (EPU)
18.	04/04/2001	2.00 – 5.00pm	Multimedia Development Corporation (MSC)
19.	05/04/2001	9.00 – 10.00am	Ministry of Information
20.	05/04/2001	10.30 – 11.30am	Ministry of Health
21.	05/04/2001	2.00 – 5.00pm	MIMOS – Jaring & Mobile Internet Unit
22.	06/04/2001	7.30am – 12.30pm	Maxis – Rural Internet Centre (Bentong)
23.	06/04/2001	2.00 – 3.00pm	Fiberail figure
24.	06/04/2001	3.00 – 4.00pm	TtdotCom (& TimeNet)
25.	06/04/2001	4.00 – 5.00 pm	CMC – Industry Research & Analysis



## Annex 2: Acronyms and abbreviations

<b>ABC</b>	Asia Broadcast Centre
<b>ADSL</b>	Asynchronous Digital Subscriber Line
<b>AMP</b>	Airtime Management & Programming
<b>ARIX</b>	Asia Regional Internet Exchange
<b>ASEAN</b>	Association Of South East Asian Nations
<b>ASP</b>	Application Services Provider
<b>ATM</b>	Asynchronous Transfer Mode
<b>BMI</b>	Body Mass Index
<b>CME</b>	Continuing Medical Education
<b>CSP</b>	Content Applications Service Provider
<b>DAGS</b>	Demonstrator Application Grant Scheme
<b>EG</b>	Electronic Government
<b>GDP/GNP</b>	Gross Domestic Product/Gross National Product
<b>GPRS</b>	General Packet Radio Services
<b>GSM</b>	Global System for Mobile Communication
<b>HDI</b>	Human Development Index
<b>ICT</b>	Information and Communication Technology
<b>IP</b>	Internet Protocol
<b>ISDN</b>	Integrated Services Digital Network
<b>ISP</b>	Internet Service Provider
<b>IT</b>	Information Technology
<b>ITU</b>	Industrial Training Institutes
<b>JARING</b>	Joint Advanced Integrated Networking
<b>KLIA</b>	Kuala Lumpur International Airport
<b>KLSE</b>	Kuala Lumpur Stock Exchange
<b>K-society</b>	Knowledge-based society
<b>MAMPU</b>	Malaysian Administrative Modernization and Management Planning Unit
<b>MCMC</b>	Malaysian Communications and Multimedia Commission
<b>MCMCA</b>	Malaysian Communications and Multimedia Commissions Act 1998
<b>MDC</b>	Multimedia Development Corporation
<b>MECM</b>	Ministry of Energy, Communication and Multimedia
<b>MIU</b>	Mobile Internet Unit

<b>MQLI</b>	Malaysian Quality of Life Index
<b>MECM</b>	Ministry of Energy, Communications and Multimedia
<b>MEPS</b>	Malaysian Electronic Payments System
<b>MIMOS</b>	Malaysian Institute of Microelectronic Systems
<b>MMDS</b>	Multi-point Distribution System
<b>MMU</b>	Multimedia University
<b>MoE</b>	Ministry of Education
<b>MoH</b>	Ministry of Health
<b>MSC</b>	Multimedia Super Corridor
<b>MCSL</b>	Malaysia Civil Service Link
<b>MYNIC</b>	Malaysian Network Information Centre
<b>NECC</b>	National E-Commerce Committee
<b>NEP</b>	New Economic Policy
<b>NFP</b>	Network Facilities Provider
<b>NILC</b>	National Internet Literacy Campaign
<b>NITA</b>	National IT Agenda
<b>NITC</b>	National Information Technology Council
<b>NSP</b>	Network Services Provider
<b>NSTB</b>	New Straights Times Press
<b>PC</b>	Personal Computer
<b>PSTN</b>	Public Switched Telephone Network
<b>R&amp;D</b>	Research and Development
<b>RM</b>	Malaysia Ringgit. 3.80 Malaysia Ringgit = 1 US Dollar
<b>RTM</b>	Radio Television Malaysia
<b>SME</b>	Small and Medium Enterprises
<b>SMI</b>	Small and Medium Industries
<b>SMS</b>	Short Messaging Service
<b>SDH</b>	Synchronous Digital Hierarchy
<b>STIX</b>	Singapore Internet Exchange
<b>TMB</b>	Telekom Malaysia Berhad
<b>TRI</b>	Technology Resources Industries

<b>UNIMAS</b>	Universiti Malaysia Sarawak
<b>UNITAR</b>	Universiti Tun Abdul Razak
<b>UNITAR</b>	United Nations Institute for Training and Research
<b>Unitele</b>	Universiti Telekom
<b>VoIP</b>	Voice over Internet Protocol
<b>WAP</b>	Wireless Application Protocol
<b>WTO</b>	World Trade Organization
<b>3G</b>	Third generation mobile

### Annex 3: Useful links

Organization	Website
<b>Main government-related ICT organizations</b>	
Ministry of Energy, Communications and Multimedia	<a href="http://www.ktkm.gov.my">www.ktkm.gov.my</a>
Malaysian Communications and Multimedia Commission	<a href="http://www.cmc.gov.my">www.cmc.gov.my</a>
National Information Technology Council	<a href="http://www.nitc.org.my">www.nitc.org.my</a>
Multimedia Development Corporation	<a href="http://www.mdc.com.my">www.mdc.com.my</a>
Malaysian Institute of Microelectronic Systems (MIMOS)	<a href="http://www.mimos.my">www.mimos.my</a>
Malaysian Administrative Modernisation and Management Planning Unit (MAMPU)	<a href="http://www.mampu.gov.my">www.mampu.gov.my</a>
<b>Main ICT providers</b>	
Telekom Malaysia Berhad (TMB)	<a href="http://www.telekom.com.my">www.telekom.com.my</a>
Celcom (Malaysia) Sdn. Bhd	<a href="http://www.celcom.com.my">www.celcom.com.my</a>
Maxis Communications Berhad	<a href="http://www.maxis.com.my">www.maxis.com.my</a>
DiGi Telecommunications Sdn. Berhad	<a href="http://www.mutiara.com.my">www.mutiara.com.my</a>
TIME dotCom Berhad	<a href="http://www.time.com.my">www.time.com.my</a>
<b>Mass media</b>	
Bernama, national news agency	<a href="http://www.bernama.com">www.bernama.com</a>
New Straits Times	<a href="http://www.emedia.com.my">www.emedia.com.my</a>
The Star	<a href="http://thestar.com.my">thestar.com.my</a>
Radio Television Malaysia (RTM)	<a href="http://www.rtm.net.my">www.rtm.net.my</a>
Sistem Televisyen Malaysia Berhad (TV3)	<a href="http://www.tv3.com.my">www.tv3.com.my</a>
Natseven (ntv7)	<a href="http://www.ntv7.com.my">www.ntv7.com.my</a>
Cableview	<a href="http://www.megatv.com.my">www.megatv.com.my</a>
MEASAT Broadcast Network Systems	<a href="http://www.astro.com.my">www.astro.com.my</a>
<b>Academic</b>	
Ministry of Education (MOE)	<a href="http://www.moe.gov.my">www.moe.gov.my</a>
Telekom Smart School Portal	<a href="http://www.tss.com.my/portal_smart1.htm">www.tss.com.my/portal_smart1.htm</a>
MDC Smart School flagship	<a href="http://www.mdc.com.my/msc/flagship/ss.html">www.mdc.com.my/msc/flagship/ss.html</a>
My e tutor: educational portal	<a href="http://www.myetutor.com">www.myetutor.com</a>
Multimedia University (MMU)	<a href="http://www.mmu.edu.my">www.mmu.edu.my</a>
Unversiti Tun Abdul Razak (UNITAR)	<a href="http://www.unitar.edu.my">www.unitar.edu.my</a>
<b>Health</b>	
Ministry of Health	<a href="http://www.moh.gov.my">www.moh.gov.my</a>
MDC Telehealth flagship	<a href="http://www.mdc.com.my/msc/flagship/tm.html">www.mdc.com.my/msc/flagship/tm.html</a>
<b>Electronic commerce</b>	
Malaysian Electronic Payment System	<a href="http://www.meps.com.my">www.meps.com.my</a>
<b>Portals</b>	
Malaysia Civil Service Link	<a href="http://mcsl.mampu.gov.my">mcsl.mampu.gov.my</a>
Malaysia Portal	<a href="http://www.mymalaysia.net.my">www.mymalaysia.net.my</a>
<b>Other</b>	
Department of Statistics Malaysia	<a href="http://www.statistics.gov.my/English/page2.html">www.statistics.gov.my/English/page2.html</a>
Economic Planning Unit	<a href="http://www.epu.jpm.my">www.epu.jpm.my</a>
Ministry of Information	<a href="http://www.kempen.gov.my">www.kempen.gov.my</a>
Malaysian Network Information Centre (MYNIC)	<a href="http://www.mynic.net">www.mynic.net</a>
Official tourism site Malaysia	<a href="http://www.tourism.gov.my">www.tourism.gov.my</a>
Kuala Lumpur Stock Exchange	<a href="http://www.klse.com.my">www.klse.com.my</a>

## Annex 4: Framework dimensions

Level 0	<i>Non-existent</i> : The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. There may be some Internet users in the country; however, they obtain a connection via an international telephone call to a foreign ISP.
Level 1	<i>Embryonic</i> : The ratio of users per capita is on the order of magnitude of less than one in a thousand (less than 0.1%).
Level 2	<i>Established</i> : The ratio of Internet users per capita is on the order of magnitude of at least one in a thousand (0.1% or greater).
Level 3	<i>Common</i> : The ratio of Internet users per capita is on the order of magnitude of at least one in a hundred (1% or greater).
Level 4	<i>Pervasive</i> : The Internet is pervasive. The ratio of Internet users per capita is on the order of magnitude of at least one in 10 (10% or greater).

Level 0	<i>Non-existent</i> . The Internet does not exist in a viable form in this country. No computers with international IP connections are located within the country. A country may be using UUCP connections for email and USEnet.
Level 1	<i>Single location</i> : Internet points-of-presence are confined to one major population centre.
Level 2	<i>Moderately dispersed</i> : Internet points-of-presence are located in at least half of the first-tier political subdivisions of the country.
Level 3	<i>Highly dispersed</i> : Internet points-of-presence are located in at least three-quarters of the first-tier political subdivisions of the country.
Level 4	<i>Nationwide</i> : Internet points-of-presence are located in all first-tier political sub-divisions of the country. Rural dial-up access is publicly and commonly available and leased line connectivity is available.

Sector	Rare	Moderate	Common
Academic - primary and secondary schools, universities	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Commercial-businesses with > 100 employees	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers
Health-hospitals and clinics	>0-10% have leased-line Internet connectivity	10-90% have leased-line Internet connectivity	>90% have leased-line Internet connectivity
Public-top and second tier government entities	>0-10% have Internet servers	10-90% have Internet servers	>90% have Internet servers

Sectoral point total	Absorption dimension rating	
0	Level 0	<i>Non-existent</i>
1-4	Level 1	<i>Rare</i>
5-7	Level 2	<i>Moderate</i>
8-9	Level 3	<i>Common</i>
10-12	Level 4	<i>Widely used</i>

		Domestic backbone	International Links	Internet Exchanges	Access Methods
Level 0	<i>Non-existent</i>	None	None	None	None
Level 1	<i>Thin</i>	≤ 2 Mbps	≤ 128 Kbps	None	Modem
Level 2	<i>Expanded</i>	> 2 - 200 Mbps	> 128 kbps -- 45 Mbps	1	Modem 64 Kbps leased lines
Level 3	<i>Broad</i>	> 200 Mbps -- 100 Gbps	> 45 Mbps -- 10 Gbps	More than 1; Bilateral or Open	Modem > 64 Kbps leased lines
Level 4	<i>Immense</i>	> 100 Gbps	> 10 Gbps	Many; Both Bilateral and Open	< 90% modem > 64 Kbps leased lines

Level 0	<i>None:</i> The Internet is not present in this country.
Level 1	<i>Single:</i> A single ISP has a monopoly in the Internet service provision market. This ISP is generally owned or significantly controlled by the government.
Level 2	<i>Controlled:</i> There are only a few ISPs because the market is closely controlled through high barriers to entry. All ISPs connect to the international Internet through a monopoly telecommunications service provider. The provision of domestic infrastructure is also a monopoly.
Level 3	<i>Competitive:</i> The Internet market is competitive and there are many ISPs due to low barriers to market entry. The provision of international links is a monopoly, but the provision of domestic infrastructure is open to competition, or vice versa.
Level 4	<i>Robust:</i> There is a rich service provision infrastructure. There are many ISPs and low barriers to market entry. International links and domestic infrastructure are open to competition. There are collaborative organizations and arrangements such as public exchanges, industry associations, and emergency response teams.

Level 0	<i>None:</i> The Internet is not used, except by a very small fraction of the population that logs into foreign services.
Level 1	<i>Minimal:</i> The small user community struggles to employ the Internet in conventional, mainstream applications.
Level 2	<i>Conventional:</i> The user community changes established practices somewhat in response to or in order to accommodate the technology, but few established processes are changed dramatically. The Internet is used as a substitute or straight-forward enhancement for an existing process (e.g. e-mail vs. post). This is the first level at which we can say that the Internet has "taken hold" in a country.
Level 3	<i>Transforming:</i> The user community's use of the Internet results in new applications, or significant changes in existing processes and practices, although these innovations may not necessarily stretch the boundaries of the technology's capabilities. One strong indicator of business process re-engineering to take advantage of the Internet, is that a significant number (over 5%) of Web sites, both government and business, are interactive.
Level 4	<i>Innovating:</i> The user community is discriminating and highly demanding. The user community is regularly applying, or seeking to apply the Internet in innovative ways that push the capabilities of the technology. The user community plays a significant role in driving the state-of-the-art and has a mutually beneficial and synergistic relationship with developers.

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