

TOWARDS VALUES-BASED KNOWLEDGE SOCIETY: ISSUES AND CHALLENGES IN MALAYSIA

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ABSTRACT

To address the gap between the informed and the uninformed, the Malaysian government has begun to invest in social and human development, and in knowledge generation as opposed to just technology deployment. The strategy includes government intervention through the setting up of the National IT Council (NITC), embarked on an ambitious programme to establish a "Multimedia Super Corridor" (MSC) and launched the National IT Agenda (NITA) and Bridging the Digital Divide (BDD) Program to close the gap between the "have" and "have-not." In relation to this, the government has set specific milestones: to become an information society by 2005, where people will have access to information and information will be regarded as a commodity; and to become a knowledge-based society by 2010, where the culture of life-long learning and the creation of knowledge-based products and services are cultivated.

This paper examines and describes the development and implementation of National ICT Initiatives (NII) and programs in the creation of a "Knowledge Society" and "K-Economy" in Malaysia.

INTRODUCTION

In common with other countries, Malaysia recognizes that Information and Communication Technologies (ICTs) and the National Information Infrastructure (NII) can provide a platform for technological and economic long-term development. Over the last ten years, the Malaysian Government has launched several major initiatives relating to ICT and NII. In 1992, *Vision 2020*, Malaysia's statement of its national goals, clearly articulated the country's objective of achieving developed-nation status, while moving towards the creation of a "Values-Based Knowledge Society". Recently, in its attempt to achieve this objective, the Government through the Third Outline Perspective Plan (2001-2010) and the Eighth Malaysia Plan (2001-2005) has

embarked on an ambitious plan and program to position Malaysia as a competitive Knowledge-Based economy, with ICT facilitating the development.

Despite this ambitious effort, there are many issues, which have still not been resolved. The dominant issues are related to two key questions: firstly, whether there would be a balanced development of the NII throughout the country, so as not to create a new divide in Malaysia between the "information-rich" in the MSC and the "information-poor" among the rest of the general population. Secondly, whether there is a NII to support and sustain the development of world-class ICT expertise among the new generation of Malaysians or a high level of IT literacy among the general population.

The aim of this paper is to review the Malaysian approach in developing and implementing National ICT Initiatives (NII) in the creation of the “Values-Based Knowledge Society” in the country. It also addresses various issues that must be faced by Malaysia in positioning itself towards achieving a fully developed nation status by the year 2020. The first section discusses the role and importance of ICT in Malaysia’s development process. This is followed by a review of strategic ICT initiatives and developments, including the establishment of National IT Council (NITC) to coordinate and manages ICT activities and the development of the national information infrastructure. The development and implementation of Multimedia Super Corridor (MSC), Demonstrator Application Grant Scheme (DAGS), and Bridging the Digital Divide Program were also presented. In the third section, the challenges faced by the country are highlighted

THE IMPORTANCE OF ICT IN MALAYSIA’S DEVELOPMENT

It is very clear that ICT has been recognized as strategic in Malaysia’s development planning, to enhance its international competitiveness and productivity in the region. The Industrial Master Plan (IMP) launched in 1985, recognized electronics and ICT industry as industries to be promoted. The IMP also gave attention to the software industry, as another strategic industry to be stimulated. In 1990, the Ministry of Science, Technology and the Environment published a report on *Industrial Technology Development - A National Plan of Action* (APITD) (MOSTE, 1990), which again highlighted the crucial role of microelectronics and ICT in the national development process. APITD noted that microelectronics and ICT are competitive tools in the global scenario:

“IT has aptly been recognized as the foundation of the second industrial revolution, and has been targeted by virtually all industrialized and industrializing economies as a strategic competitive weapon for attaining efficiency and competitiveness in world trade.... Two objectives are related to new technologies; firstly to increase the utilization of these modern technological options by local industry, and secondly to build up a body of competence and expertise in these advanced fields.” (MOSTE, 1990, 15)

The Third Outline Perspective Plan (2001-2010) has embarked on an ambitious plan to position Malaysia as a competitive Knowledge-based economy, with ICT facilitating the development. The major thrusts of Knowledge-based economy development plan for Malaysia will be as follows:

- a) Building the knowledge manpower base, among others, through a comprehensive review of the education and training system, the introduction of a system for life-long learning and a brain-gain programme;
- b) Intensifying S&T and R&D initiatives towards strengthening the national innovation system;
- c) Accelerating the development of *infrastructure* to facilitate the development of the knowledge-based economy;
- d) Restructuring the financial system to provide appropriate types of financing for knowledge activities, avail the tools for macroeconomic management and withstand the challenges associated with the knowledge-based economy;
- e) Raising the knowledge content in agriculture, manufacturing and services sector;
- f) Getting the private sector to prepare themselves with greater urgency for the knowledge-based economy as well as

identify and exploit the opportunities that will be generated;

- g) Encourage the private sector to transform so that they are competitive;
- h) Reinventing the public sector to become more proficient in the acquisition, utilization, dissemination and management of knowledge;
- i) Foster the ethical utilization of knowledge; and
- j) Take affirmative action to bridge the digital divide between income, ethnic and age groups, urban and rural communities, and across regions.

The Eighth Malaysia Plan (2001-2005) recognized ICT as an important tool to support the growth of the Malaysian economy, as well as to enhance the quality of life of the population. During the Eighth Plan period, advancements in ICT are expected to have a significant impact on the development process and lifestyle of the population. At this time, the Government plans to strengthen the foundations for building a knowledge-based society and economy. Given the strategic role of ICT in the attainment of these goals, major initiatives will be undertaken to expand the nation-wide information infrastructure network and services. The thrust of ICT development will be in the area of:

- a) Positioning Malaysia as a major global ICT hub
- b) Expanding the communications infrastructure
- c) Enhancing human resource development in ICT
- d) Fostering creative content development locally
- e) Rolling-out the MSC flagship applications
- f) Nurturing ICT-based SMEs; and

- g) Promoting R&D activities as soft factors

Review of National Information Communication Technology Initiatives (NII) and Development

Realizing the important role of ICT as a catalyst for national development, the Malaysian Government has started several major initiatives covering sectors in the Government and industry, as follows:

- The establishment of the National IT Council (NITC)
- The formulation of the National IT Agenda (NITA)
- The development of the Multimedia Super Corridor (MSC)
- Demonstrator Application Grant Scheme (DAGS)
- Bridging the Digital Divide (BDD) Program

The following section will review each initiative, explaining its objectives and status.

The Establishment of the NITC

Realizing the failure of previous efforts, and recognizing the urgent need for greater coordination and leadership in the planning and management of ICT as a strategic tool for national socio-economic development, the Government has taken the initiative to establish the NITC. Its inception occurred in May 1993, with the appointment of the Malaysian Institute of Microelectronics (MIMOS) as its Secretariat. With the aim of creating an “information-rich society”, in line with the aspirations of *Vision 2020*, NITC seeks to enhance the development and utilization of ICT as strategic technology for national development.

NITC is responsible for strategic planning, coordination and evaluation, technology

assessment and forecasting and finally, promotion of ICT. In its capacity as a coordinator, the Council focuses on the following activities: monitoring and tracking progress in development programmes, including human resource development; formulating performance indicators and ICT standards; evaluating the effectiveness of ICT use in organizations; building the appropriate legal framework for regulation and development of the sector; and providing incentives for accelerated growth (Shariffadeen, 1994).

The NITC initiated the process of formulating a national ICT plan and identifying key programmes which will contribute to the transformation of Malaysian society into a knowledge-based society. Several programmes, such as seminars and exhibitions about ICT, aimed at increasing awareness of the importance and relevance of ICT in enhancing the quality and productivity of output at the national, organizational and personal levels, have been implemented under the aegis of the NITC (GOM, 1997).

Shariffadeen (1996) claimed that ICT policy planning and management under the guidance of the NITC, has reached the most advanced state since it first became a major item in the country's development agenda. According to Shariffadeen, with the Prime Minister as Chairman and the Deputy Prime Minister as Deputy Chairman, and supported by 28 other members representing senior officers in the public, private and community sectors, the NITC has rapidly repositioned ICT strategically in the national development programme.

The Formulation of the NITA

Under the initiative of the NITC, a National IT Agenda (NITA) was formulated and announced in December 1996, by the Prime Minister, to map out a

strategy to propel the nation into the position of being a center of excellence for multimedia technology. The Agenda with the theme "Turning Ripples Into Tidal Waves" stated that its mission is:

"... to nurture a knowledge society premised on our own history, tradition, culture and development experiences. This knowledge society must also become a civil society. The transition from merely accessing information to infusing knowledge and becoming a civilization is subtle but critical. The creation of a civil society will be the ultimate vision of the IT Agenda. A civil society of the future must be a society where the wise rule and the people actively participate in determining their destiny. The ownership of knowledge may be less privatized and personalized but will become trusteeships of civil property. The pursuit and application of knowledge will continue for the personal and public good. Electronic governance may help realize the ideals of a participative democracy with greater transparency. One cornerstone of civility will remain the notion of human dignity. The right of individuals against poverty and starvation is also a basic and an inalienable human right. This is our notion of a genuinely caring society, one which is duty-bound to take care of the interests of everyone in society." (Mohamed, 1996)

The NITA stresses the need for a balanced development of three important inter-related elements: people, info-structure and applications. A three-pronged strategy, with the mission of building a Values-Based Knowledge Society was mooted. The first step is to build and develop the appropriate physical infrastructure and info-structure. The second step is the creation and development of enrichment systems or IT-based applications that are demand-driven. Finally, at the third stage

of the NITA, is the human development effort.

The Development of the MSC

As mentioned above, one of the main initiatives under the NITA is the development and implementation of the MSC. The MSC is a 15 km wide by 50 km long corridor that runs from the world's tallest building in the Kuala Lumpur City Centre (KLCC), down to the Kuala Lumpur International Airport (KLIA). Its major components are KLCC, Putrajaya, Kuala Lumpur International Airport (KLIA) and "IT City". Technologically, the area will be served by a fiber-optic backbone with 2.5 gigabits per second (Gbps) capacity, upgradeable to 10 Gbps when required. Linked to this will be a wide-area network that can transmit up to 155 megabits of data per second for efficient multimedia transmission. There will also be a 5 Gbps international gateway connection to the US, Europe, Japan and other Asian and ASEAN countries.

The MSC is a clear commitment of the Malaysian Government, in the development of its own NII. The MSC initiative arises out of a proposal made to the Prime Minister and the NITC, by the consultant firm McKinsey & Company, the details of which are encapsulated in the report entitled *Making Malaysian Miracle - A Strategy for Success in the Information Age* (McKinsey and Company, 1995). McKinsey's contention is that the current development strategy, based largely on manufacturing capabilities, being pursued by Malaysia, is likely to result in per capita GDP stagnating around RM12, 577 (US\$5,000), and its global competitive edge being eroded.

The vision of the MSC is to create a network society in which the MSC, in the year 2020, will act as:

"... a multicultural 'web' of mutual dependent international and Malaysian companies collaborating to deliver new products and services to customers across an economically vibrant Asia and the world. I fully expect that this 'web' will extend beyond Malaysia's borders and out across Malaysia's multicultural links to our neighbors. Component manufacturing can then be done in China, on machines programmed from Japan, with software written in India, and financing coming from Malaysia's Labuan International Offshore Financial Centre. The product may be assembled in Penang and shipped to global customers direct through our new airport." (Mohamed, 1997)

Different from other NII in other countries, the strategy for the development and implementation of the MSC is not specific on technological or the development of the telecommunication and communication network infrastructure, but the focus is on the creation of an environment for multimedia companies:

"Malaysia is offering the world a special green field environment designed to enable companies to collaborate in new ways and reap the rich rewards of the Information Age. There are no legacies of artificial constraints created and perpetuated by entrenched interests. We offer the Multimedia Super Corridor as a gift to the world - a global bridge to the Information Age that will enable genuine mutual enrichment for our partners possessing the vision to participate.

I see the MSC as the leading edge of a new national strategy for Malaysia to achieve the goals described in our country's Vision 2020. I fully expect to see a few world-class Malaysian companies emerge from the MSC. It will accelerate the development of a

strong services sector to balance our already strong manufacturing sector while helping to improve the productivity and quality of living in the nation. Equally important, the MSC will provide a platform to tie us together and celebrate our culture while helping to educate us in new and different ways. It will allow us to bring together our multicultural knowledge and relationships to mutually enrich our partners, neighbours and ourselves.” (Mohamed, 1997)

This strategy is aiming to encourage world-beating, leading-edge, high-tech companies to establish their regional headquarters and research and development facilities within the MSC. The strategy is important because: firstly, Malaysia cannot imitate other countries approaches to the Information Age because it lacks expertise and technological capability and capacity. This was stated clearly by the Prime Minister:

“Malaysia is not trying to build a replica of Silicon Valley or Hollywood. We would be deluding ourselves if we expect storyboards not to be created in Hollywood or R&D on the highest valued-added components not to be done in Silicon Valley. We realize you are more advanced and that we have much to learn, but precisely because you are so developed there are very important things we can do that you cannot....” (Mohamed, 1997)

The second reason is that foreign direct investment has been the engine of Malaysia’s development and thus, the creation of such environment and infrastructure will attract more foreign investment. Average Malaysian workers are still lagging behind in terms of productivity compared to their Asian neighbors. The *National Productivity Report* (National Productivity Corporation, 1996) revealed that, in 1995, Malaysia’s

workers only generate US\$1 (RM2.50) of GDP, while workers in Singapore contribute US\$2.79 (RM6.98), Hong Kong - US\$2.61 (RM6.52), Taiwan - US\$1.71 (RM4.35) and South Korea - US\$1.27 (RM3.18) of GDP. Malaysia’s labor costs however, are on the rise and 16 plants have shut down in 1996 when companies moved their production to the Philippines, Indonesia, and China. Increasingly, the Government is aware that it cannot compete with its neighbours that offer huge, low-cost manufacturing workforce - hence it attempts to shift from labor- to knowledge-intensive industries (Fergusson, 1997).

The objective of the MSC is to be a showcase for the development and application of multimedia in industry and business as well as for life and work in general. World-class companies in these business areas will be invited and encouraged by local companies to become their business partners (Mohamed, 1995).

The Demonstrator Application Grant Scheme (DAGS)

To further spur the growth of a totally wired nation, NITC designed another initiative called the Demonstrator Application Grant Scheme (DAGS), which focuses on the creation and nurturing of interactive clusters of electronic communities. DAGS is based on a creative smart partnership, which is termed as a “win-win-win, risk-taking and reward sharing for a common agenda (3W2R1A) model”¹ - a strategic collaboration between the community, public and private sectors. Demonstrator Applications (DAs) are undertaken by project promoters to showcase new possibilities of using ICT as the enabler in the creation of a values-based knowledge society - thus minimizing the digital divide. Various applications/systems resulting from the scheme are to be replicated or extended to the rest of the country to create online

platforms or exchanges, which can either be commercialized or globalized.

Officially launched on 21 April 1998, the DAGS' mission is to facilitate the social and economic progress of Malaysians through the utilization and innovative use of the Information and Communication Technologies (ICT). The NITC spelled out five priority areas for further development: E-learning, E-community, E-Economy, E-public services and E-sovereignty.

There are six main objectives of the DAGS. These are to:

- a) Acculturate Malaysians to ICT, enabling them to maximize the benefit of ICT applications at work and at home.
- b) Build an integrated network of electronic communities using ICT and multimedia technology.
- c) Promote the dynamic growth of Malaysians web-shapers and web-adapters.
- d) Develop entrepreneurial communities enabled by electronic networks.
- e) Enhance closer co-operation and collaboration between public agencies, private corporations, non-profit organizations and NGOs through joint ventures and institutional linkages.
- f) Encourage Malaysians to be more innovative in using and adapting existing ICT and multimedia technologies

DAGS projects stresses on the following aspects:

- a) Tri-sectoral partnership - The three sectors; the public, private and community sector, have to work together in a tri-sectoral smart partnership arrangement.

- b) Community development through ICT - This approach focuses on community of users, not the industries.

- c) Clarity in goals and deliverables - Clear processes in achieving objectives

- d) Sustainable development - How do we build so-called increasing returns that go against the normal model of economy? The normal economy is based on decreasing returns. The new economy of increasing returns is based on knowledge and information creating more knowledge and information. In other words, human minds creating knowledge and information to produce innovation, which in turn would lead to sustainable development.

- e) Quick realization - Fund for short term / 1 year project.

In terms of spending, out of the Malaysian Ringgit 50 million (approximately £9.3 million) allocated for DAGS under the Seventh Malaysia Plan - a period that spanned from 1995 to 2000, a total of Malaysian Ringgit 44.58 million (£8.25 million) grant has been committed. Under the Eighth Malaysia Plan (2001 to 2005), the budget for DAGS has been doubled to a total of Malaysian Ringgit 100 million (approximately £18.5 million).

Approximately more than 1.6 millions individuals, who constitute the target communities for the respective DAGS projects, have benefited from DAGS. A sizeable chunk of the beneficiaries can be categorized as those at risk of being marginalized and may be relegated to the unfortunate side of the digital divide if steps are not taken to avoid it.

Implementing Agency	Program Title	Objective	Current Status	Planned Deliverables
Min. of Energy, Communication and Multimedia	Universal Service Provision	To elevate basic communication penetration rate to 35% (17.5% for non-urban areas)	Considering technologies such as cable, Very Small Aperture Satellite, CDMA, and others	To provide communication infrastructure to 2337 schools by year 2005.
Min. of Energy, Communication and Multimedia	Internet Desa	Ensure provision of equal access to those who can afford through the existing national infrastructure.	Phase I – Internet Desa at 14 Post Offices	Phase II (2001-2003) – 100 locations per year Phase III (2003-2005) – areas with new infrastructure Involves portal development, infrastructure supply, awareness and training
Min. of Rural Development	Infodesa	Ensure rural communities are not denied rights to information on the Internet, left-out in the digital divide with respect to urban communities and enjoy the quality of life	Six pilot Medan Infodesa to be developed in 2001. Rural Computer Literacy Courses at 6 centers.	2001 – 26 literacy courses
MIMOS Berhad	Titian Digital (formerly Digital Divide)	- Empowering average population on the use of ICT for sustainable economic and social development - Growing knowledge-based economic activities in rural areas	Developing contents on education, rural economics, health, and others (subject to feedback).	Educational content for formal, informal and non-formal learning. Setting-up of Kelab Digital. Exploring the development of affordable content access devices.

Table 1: The Key Program for Bridging the Digital Divide Initiatives

Bridging the Digital Divide Program

The Eighth Malaysia Plan recognized the need to close the digital divide especially between rural and urban areas. An allocation of RM5.16 billion was allocated for the development of ICT-related programs under the Eighth Plan. Among the key program under BDD are Universal Service Obligation, Internet Desa, InfoDesa and Titian Digital. Table 1, explained the detail of the implementation

agencies, objectives, status and planned deliverables of the key BDD Programmes.

Some Critique on the Implementation of The NII in Malaysia

Studies of the implementation of NIIs (see Wong, 1997; West, Dedrick and Kraemer, 1997, for example) have emphasized that the process is likely to be difficult and prolonged. This will not be simply a matter of tardiness in implementation, but a reflection of the very considerable

obstacles that have to be overcome to adapt the NII, to the particular needs of the society. The process of implementation demands progressive development and evolution, and requires a co-operative relationship between the actors involved. Implementing a NII goes beyond technological capability to managerial, social and economic issues.

CHALLENGES

Universal Access

There is a belief, especially among the Democratic Action Party (DAP), an opposition party of Malaysia, that MSC-centered National ICT strategy might not serve the interests of all Malaysians and is likely to create a new disparity between the “information-rich” and the “information-poor” among the people, particularly in certain regions. The Party suggests that the Government should focus on a people-centered National ICT strategy, which would ensure that the MSC is part of a balanced development of the information infrastructure in the country, benefiting all Malaysians. The members of the Party believe that an “MSC-centered” National ICT strategy, for instance, would give priority to attracting the best knowledge workers from all over the world, while a people-centered National ICT strategy, would give the greatest priority to raising the ICT literacy rate, across all sectors of the population and create a pool of highly-trained ICT professionals among Malaysians.

Siang (1997) argued that while Malaysians may have reasons to be proud of such an MSC, these ICT developments must be seen from a proper national and international perspective:

“Firstly, the publicity hype over the MSC gives the impression that Malaysia is the first country to create an ‘intelligent city’, when ‘intelligent

cities’ are being built in other parts of the world, and even the Philippines has an ambitious plan to build a ‘Cyber City’ at the Subic Bay Freeport, while other countries, like Singapore, New Zealand and Canada are already setting the goal of creating an entire ‘intelligent nation’.

Secondly, an expenditure of RM2 billion (US\$0.5 billion) to RM4 billion (US\$1.0 billion) to have a ‘demonstration effect’ on multimedia in a 15 by 50 kilometer corridor, is not entirely a proper order of priorities in promoting ICT in Malaysia.

Thirdly, the MSC project fosters the image that Malaysia is in the forefront of ICT innovation in the world. However this is not the case. The International Telecommunications Union (ITU) recently compared 39 nations in terms of their ‘multi-media readiness’, by comparing the provision of telephone lines and the uptake of televisions and computers per head. In this comparison, Malaysia ranked 28th. The first 20 ranking nations are the United States, Denmark, Canada, Sweden, Australia, France, Switzerland, the Netherlands, Germany, Japan, the United Kingdom, Australia, Belgium, Singapore, Hong Kong, Spain, Italy, Hungary, South Korea and Taiwan. This is an indication that Malaysia has still a long way (to go) to catch up with the other high-flyer nations in information technology.

Fourthly, whether the MSC project is compatible with the principle of ‘universal, affordable and equitable access’ of the Information Highway, to make the NII affordable and ubiquitous to all Malaysians, to eliminate the ‘tyranny of distance’ and to ensure that there is no new division of Malaysians into the ‘information-rich’ and the ‘information-poor’.” (Siang, 1997)

Meanwhile, Subramaniam (1997) argued that it must be admitted that rapid development in Malaysia has brought disparity between children in rural schools and those in urban schools. According to Subramaniam, many rural children cannot afford a computer and some have not even seen one. About 20 per cent of children in the country cannot read or write well and at least 15 per cent have no literacy skills at all.

ICT Policy

The biggest defect in Malaysia's national ICT policy is the lack of a coherent and integrated ICT plan and strategy, based on a national consensus about the importance of Malaysia's making a transition to the information society, and a general recognition that ICT is not just about technology or commercial considerations, but about how to improve the quality of life of all Malaysians. The importance of ICT was formally acknowledged only in the Seventh Malaysia Plan, whilst other countries have made a head start in preparing their societies for the information revolution. Although the NITC had been set up and the process of formulating a national ICT plan had been initiated, there had been no attempts to put the plan into operation. Realizing the absence of, and urgent need for, a National ICT Plan, the DAP (Siang, 1996) proposes that the country should formulate an *IT 2005 Rolling Action Plan* to chart the Malaysian Way to an Information Society.

Manpower and ICT

The shortage of ICT manpower in the country was also confirmed in the survey by SRI International, *Forecasting Malaysia's Science and Technology Human Resources and Research and Development Investment Needs Leading to the Year 2020*, for the Ministry of Science, Technology and Environment (MOSTE, 1996[b]). The findings from the survey

reveal that Malaysia is currently facing a shortage in the number of scientists, engineers and technicians, especially in the electric, electronics and communication sectors.

ICT Literacy

Computer literacy in Malaysia, especially in the rural areas, is still low. At present, Malaysia lags behind many other countries in IT-literacy. For example, according to the *World Competitiveness Yearbook* (GEF, 1996), Malaysia is ranked number 29 for "computer power per capita" - that is MIPS (millions of instructions per second) per 1,000 people, out of 46 countries, while the top twelve nations being the USA, Norway, Canada, Sweden, Denmark, New Zealand, Finland, Australia, the United Kingdom, the Netherlands, Singapore and Switzerland. Meanwhile, the *Global Competitiveness Report*, (1996) ranked Malaysia as number 26 for "computers per capita", while the top twelve nations are the USA, Australia, Canada, Norway, Finland, New Zealand, Denmark, the Netherlands, the United Kingdom, Ireland, Singapore and Germany.

A study by the Expert Group on Information Technology into Services, under the National Council for Scientific Research and Development (NSCRD, 1995[b]) identified the particular obstacles faced by schools, in improving the level of computer literacy among their pupils. These obstacles include the following: the greatest problem is undoubtedly the lack of computing infrastructure in the schools. A second problem is that many of the staff now being trained in the colleges, in the use of computers and application packages, will eventually leave to join the IT industry's lucrative private sector, once they have the acquired knowledge.

The ICT Industry in Malaysia

Various studies have shown that although the growth of the ICT industry is rapid, it faces many problems and challenges. The Second Industrial Master Plan, 1996-2005 (MITI, 1996) revealed that even though the ICT industry provides a significant contribution to the economy, it must tackle certain immediate problems. The development of indigenous capabilities has been constrained by the continued international sourcing of a major portion of the goods and services required by the electric and electronics industry. Although exports of electrical and electronic products amounted to RM314.5 billion (US\$79 billion), in the period 1990-95, with a 24.0 per cent growth (of which the exports of electronic products alone amounted to RM288 billion [US\$72 billion]) imports too expanded by 23.0 per cent, to RM 248.6 billion (US\$62.5 billion), in the same period. Imports of electrical and electronics products, amounted to RM209.8 billion (US\$62.5 billion), or 84.4 per cent. Imports of electrical and electronic products, which mainly comprised intermediate and investment goods, were utilized in the manufacture and subsequent export of E&E products. This reflected the high import ratio in the manufacture and export of electrical and electronics products (MITI, 1996).

Research and Development Capability in Malaysia

Malaysia's total R&D expenditure in 1994 was RM611.2 million (US\$160.3 million). This accounted for only 0.34 per cent of the country's GDP in that year. This is low, compared to other international standards, for example, Taiwan (1.82 per cent), Singapore (1.12 per cent) and South Korea (2.33 per cent). To put the figure into perspective, it is worth noting that SONY Corporation alone spent RM3.675 billion (US\$1.5 billion) in 1992 (*Fortune*,

Feb. 24, 1991: 21). In term of human resource efforts in R&D, Malaysia's achievement was also unimpressive. At the scale of headcounts or persons, there were only 2.3 researchers (Headcount) per 10,000 population. This is very low when compared to other newly industrialized countries such Taiwan, Singapore and South Korea. For example, in 1993, South Korea had 22 researchers (Headcount) per 10,000 populations while Singapore had 37.9 researchers per 10,000 populations in 1992. What is more interesting to note is that, despite the Government's pronouncements about the sector's importance, only 30.7 researchers or 4.3 per cent of public sector research effort were in the field of information, computer and communication technologies (MOSTE, 1994).

CONCLUSIONS

This paper has sought to review the NII initiatives in Malaysia. The programmes and projects relating to the promoting of ICT and the development of the NII have been presented. The obstacles and challenges in implementing the information technology programmes, and the development of the NII, were discussed. However it is worth highlighting two conclusions here. First, it is clear that the development of the NII, particularly the MSC, NITA, DAGS and BDD Program reflects the belief of the Malaysian Government and industry that the ICT will be powerful forces of competitive advantage in the developing global economy. These advantages will be based on a technology-driven orientation, which focuses on attracting world-class, multinational corporations and which is expected to ensure that leading-edge business users will drive the country's future infrastructure deployment and, in turn, transfer advanced technologies and lead-customer knowledge to local firms.

Second, despite these programmes, the approach by the Malaysian Government has created a number of problems that Malaysia needs to address. The Government for instance, must create a balanced development of the NII throughout the country, so as not to create a new divide in Malaysia between the “information-rich” the MSC and the “information-poor” among the rest of the general population. It also needs to provide a national “back-up” to support and sustain the development of world-class ICT expertise among the new generation of Malaysians and encourage a high level of ICT literacy among the general population.

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