بسم الله الرحمن الرحيم IN THE NAME OF ALLAH, THE MOST MERCIFUL, MOST BENEFICENT



ISLAMIC DEVELOPMENT BANK ISLAMIC RESEARCH AND TRAINING INSTITUTE INFORMATION CENTER

GUIDELINE FOR A NATIONAL IT STRATEGY

(A Study Carried out by MSC Technology Centre, Malaysia)

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FOREWORD

he Islamic Development Bank (IDB) is an international financial institution, whose aim is to foster economic development and social progress of its member countries and Muslim communities in non-member countries individually as well as jointly in accordance with the principles of Shari'ah, i.e. Islamic Law.

In order to ensure greater cooperation amongst its member countries in the social, economic, and financial spheres, the IDB and its related institutions which are now grouped together as the IDB Group, actively participate, among others, in the activities of various organs associated with the Organization of Islamic Conference (OIC) and the Islamic Summit. Thus, IDB was closely associated with the development of a document on *Preparation of the Ummah for the 21st Century in the Area of Economic, Trade and Finance Cooperation Among the OIC Member Countries.* Later, during the IDB 23rd Annual Meeting of the Board of Governors held in Cotonou, Benin, 28th Rajab 1419H (17th November 1998G), the Bank organized its 9th Annual Symposium on "*Preparing the Ummah for the 21st Century: Promotion of Information Technology for Development*".

The Recommendations of this symposium asked the Bank to develop a '*Guideline for a National IT Strategy*" to help the member countries. The main objective of conducting a study on this subject was to promote IT awareness in the member countries and identify the Centers of Excellence in the area of information technology who could cooperate with each other leading to better utilization of their services and resources.

The study was carried out by an external consultant and was assessed by a selected panel of experts in the IT field from the bank as well as from some member countries during a two-day Workshop held at IDB headquarters, Jeddah, Saudi Arabia, on 19-20 January 2003. The deliberations of this workshop did much to improve the contents of the study.

The study identifies areas of weaknesses, improvements, responsibilities, directions as well as implementation issues faced by its members to effectively utilize IT in the new economy. The study provides a framework within which the member countries can evolve and implement their national strategies for information technology and put this new resource in the service of economic development.

The study also highlights different challenges and opportunities such as social, cultural, political and economic changes, and analysis on IT development in selected countries. Further, it

deals with elements and critical success factors in the development of a successful IT Strategy in terms of policies and regulatory framework, content and community as well as IT infrastructure, human resources development, and national innovation clusters. IDB is pleased to put forth the results of this study in this book for the benefit of member countries for undertaking strategic direction toward developing national IT strategies to bridge the digital divide and take further necessary action to evolve IT strategy that would help them to tap this resource for the benefit of economic cooperation and development.

Dr. Ahmad Mohamed Ali President Islamic Development Bank

PREFACE

G iven that the main aim of IDB in commissioning this study is to promote greater awareness on the importance of IT in member countries, this study has focused more on the what, when and some why's, rather than how. This report is intended to build on past and present knowledgebase in this area to help policymakers, planners, leaders in government, business, community, and academics, especially in IDB member countries, to achieve greater understanding and, hopefully, towards making informed decisions and taking collective action. Within this context, and considering that the majority of member countries are far from having significant technology- and knowledge-based economies, the following broad definitions are used in this report:

Technology	If used on its own in this report, technology is meant to encompass the processes and knowledge by which organizations and national governments utilise, organize, and manage labour, capital, natural resources, and information to meet their respective needs.
Information Technology (IT)	The technology by which organizations and governments organize, process, manage, utilise, and disseminate information and knowledge. These processes and knowledge are frequently embedded in the hardware and software of computer, data processing, and data communication systems.
Information & Communication Technology (ICT)	The mainstream definition of IT and technologies driving the telecommunications and broadcasting arenas includes the Internet, and consumer electronic equipment such as mobile telephones and Personal Digital Assistants (PDAs).
Strategy	The decisions, choices, and investments made over the medium- to long-term (5 years and above) to achieve distinctive / differential / competitive advantages. These include policy and approaches for the implementation of the strategy.
Guidelines	A generic conceptual frame of reference that helps to clarify key elements and their relationships to one another.

In this report, the terms IT and ICT are used interchangeably, to reflect the growing convergence of the Telecommunications, Broadcasting and IT sectors.

ACKNOWLEDGEMENT

The consultant team and the Islamic Research and Training Institute (IRTI) of IDB are tremendously grateful to the management of IDB for initiating and supporting this study. Our special appreciation goes to the following experts of IDB for contributing ideas, comments and for reviewing the few drafts of this report. The members of this panel are : -

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Dr. Ahmed I. Iskanderani Chief, IRTI Information Centre Eng. Omar A. Attiah IRTI Information Centre During the course of the study, the consultant received incalculable support and assistance from the leaders and senior officers of the following government institutions and private sector organizations of several IDB member countries.

Organization	Country
Economic Development Board	Bahrain
Ministry of Finance	Bahrain
Ministry of Communications	Brunei
Human Resources Development Information Center	Jordan
Information Technology Association Jordan	Jordan
Ministry of Information and Communications Technology	Jordan
Ministry of Education	Jordan
National Information Center	Jordan
Association of Lebanese Software Industry	Lebanon
Chamber of Commerce, Industry and Agriculture	Lebanon
Lebanese Economic Forum	Lebanon
Ministry of Economy and Trade	Lebanon
Professional Computer Association	Lebanon
Communication and Multimedia Commission	Malaysia
Multimedia Development Corporation	Malaysia
National Information Technology Council	Malaysia
Malaysia Administration Modernisation Planning Unit	Malaysia
Ministry of Post, Telecommunications and IT	Malaysia
National IT Plan Project	Saudi Arabia
Ministry of Higher Education	Syria
Ministry of Communications	Syria
Ministry of Industry and Planning	Syria
International Centre for Training and Development	U.A.E
Ministry of Finance and Industry	U.A.E

1. EXECUTIVE SUMMARY

1.1 Introduction

t the onset of the 21st century, despite the meltdown of the Information and Communication Technology (ICT) sector due to the "dotcom crash" in 2000 and recent uncertain global scenario, ICT remains as important as ever to the socio-economic development of any country. Unfortunately, the majority of IDB member countries continue to lag behind in ICT development, further widening the "Digital Divide", that is the difference between those that have the capabilities and resources to access and utilize information, knowledge, and its underlying technology, and those that do not. This deepening crisis must be addressed collectively.

As an organisation established with an objective to assist with the development in member countries, IDB commissioned this study in May 2001 to develop Guidelines for a National IT Strategy (GNITS) to guide its member countries in their respective ICT development programs.

Specifically, GNITS is intended to achieve the following objectives:

- 1. Promote IT awareness in member countries by developing Guidelines for a National IT Strategy and provide technical assistance on request to member countries willing to adapt the Guidelines to their needs and conditions.
- 2. Identify leading Centres of Excellence to enable superior coordination and better utilization of their services and resources.

1.2 ICT Revolution and Characteristics

The ICT revolution is synonymous, and a consequence of the many waves of technology revolution. From its early use as mainframe computers for scientific research, ICT was applied to the automation of complex business processes. Today, it is widely acknowledged that a country's socioeconomic growth is positively linked to her ICT development and adoption. ICT has potential to reduce cost, enhance productivity and add economic value. ICT enables new and improved business processes to deliver products and services with greater effectiveness and efficiency. The knowledge and skills of the workforce coupled with effective use of technology are critical drivers to improve competitiveness and productivity of a country's corporations, industries, and ultimately the whole economy. Many developed countries have attained leadership position through massive investment and adoption of IT.

Since the 1990s, ICT innovation with the advent of Internet, has paved the way for increased market globalisation. Labour-intensive and low-value operations will continue to go to those countries that offer low-cost but unskilled or semi-skilled workers while the high-value and high-paying jobs will go to countries that have the professional and management talent, excellent ICT infrastructure, and conducive business environment.

While the impact of ICT is quite obvious, it is useful to understand the following characteristics associated with ICT development in order to formulate effective national IT strategy:

- a. ICT is subjected to network externalities, which means that once a certain critical mass of users of an application or a technology is reached, the network will experience exponential growth in users, usage and hence value.
- b. ICT is disruptive because it cuts across sectors and can disintermediation established networks and relationships between producers, distributors, dealers and end users. New applications and business models enabled by ICT will replace inefficient organisations and businesses.
- c. Successful application of ICT may come from unexpected sources.
- d. The best application often does not come from the best or latest technology but from innovative use of knowledge, skills and technological applications that meets the needs of the market.

The above characteristics and dynamics imply that planning for ICT means having to deal with speed, inter-operability standards, uncertainty and risks. The strategy for ICT therefore, needs to be opportunistic by being open to unexpected successes and failures, and by incorporating plan for learning and discovery.

1.3 ICT Challenges in IDB Member Countries

In most member countries of IDB, however, ICT has yet to play a significant role in the economic development. This fact is evident from the following indicators:

- 1. Low ICT spending (absolute as well as relative to GDP)
- 2. Low levels of telecommunications and Internet penetration
- 3. Inadequate human capital development

Many IDB member countries, particularly the Least Developed Member Countries (LDMC) are mired in the perennial problems of indebtedness, poverty, and poor literacy. As these countries must continue to channel their scarce development resources to address these primary priority issues, they will no doubt be severely constrained to meet the secondary priorities or the pre-conditions for ICT development. These pre-conditions include political and governmental stability, basic ICT infrastructure, and the right market environment. All these pre-conditions are depicted in the following figure.

<u>Secondary</u> <u>Priority</u>	rcial & iical ucture	Basic IT infrastructure				
	Comme Phys Infrastr	Political and Governmental Stability		ty	Basic Business Environment	
	etal ure	Gender equality & Empowering [women		Develo	Develop a global partnership for development	
<u>Primary</u> <u>Priority</u>	Basic soci infrastructi	Improve maternal health	Basic literacy levels Ensure environm		sure environmental sustainability	
		Poverty & Hunger	Combat HIV/AIDS, m and other disease		aria	Reduce child mortality rates

Figure 1.1 : Primary and Secondary Priorities - Pre-conditions for IT Strategy¹

It is also argued that social, spiritual and cultural factors play a part in causing the digital divide.

- a. Muslim societies' general apprehension towards the adverse effect of open, unfiltered information and content, particularly those that are culturally and morally incompatible with Islam.
- b. Political or government constraints imposed to prevent dissent that may arise as a result of unbridled freedom of expression and instant, free-flowing, open communication.
- c. Few Muslim societies' rejection of the west's technological and economic superiority because these are perceived as a new form of colonisation and hence threatening
- d. At the spiritual level, Muslim underdevelopment in science and technology is due to its different worldview and beliefs about knowledge and the purpose of man. The capitalist model's premise that man's pursuit of profit and self-interest will result in benefits for the public has proven to be wrong, as is evident in the growing gap between the rich and the poor.

The first challenge therefore is for many IDB member countries, preferably in a collective manner, to undertake the necessary reforms in education, economic, political and social spheres to reconcile the worldview and beliefs underpinning the capitalist and Islamic systems. Science and its rational approach to knowledge must be allowed to regain its place in Islam, as they once did during the height of Islamic civilization. It is no longer a question about trade-offs, but the need for Muslim countries to learn and do all at the same time while remaining strategically focused.

1.4 Overview of Strategy Analysis

The analysis for the study began with understanding the well-documented approaches in national ICT development of developing countries. The approaches and strategic thrusts taken by

¹ Adapted from UNDP "The Millennium Development Goals", United Nations Millennium Summit 2000

these countries vary due to their respective context, objectives and competitive positioning. These approaches can be grouped into two main categories:

1. ICT as a Production Sector

In this approach ICT is positioned as one of the main industries that will contribute to the economy. This approach requires the provision of incentives for the new industry to flourish and develop, usually with the ultimate aim of exporting ICT products and services.

2. ICT as an Enabler of Socio-Economic Development

As an enabler, ICT can catalyze the transformation and improvement of the wider socioeconomic environment. The strategy includes policies and incentives that are targeted to diffuse ICT in all key sectors of the economy. The outcome derived is for ICT to enable and even drive productivity improvement in all key sectors.

This study also analysed the role and impact of ICT hubs, those special industrial/economic zones designated to attract global IT and multimedia companies, nurture local ICT entrepreneurs, and provide the favourable environment for innovation.

Analysis of ICT strategy of selected IDB member countries was carried out on Malaysia, United Arab Emirates, Egypt, Saudi Arabia, Bangladesh, Jordan and Guinea. Several successful case studies of ICT initiatives at the local level within developing countries were also analysed. The analysis is aimed at drawing out common challenges and lessons learned which then served as useful input to the formulation of the Guidelines. The key lessons include:

- i. The need for government to play the catalytic and leading role because markets are under-developed in most member countries.
- ii. Focusing on ICT as a production sector can provide short-term benefits but this strategic focus is only applicable to selected member countries that have adequate ICT skills and demand from the local and regional markets.
- iii. Focusing on ICT as an enabler for socio-economic development is applicable to most IDB member countries because this will help ensure that knowledge and technology will be progressively applied to improve all key sectors of the economy. However, this approach requires a long-term view and commitment.
- iv. ICT infrastructure and human resource development are crucial but not sufficient. There must be capacity building at community and institutional levels, and the fostering of the environment for entrepreneurship and innovation.
- v. Increasing ICT research and development is required to increase the local content and intellectual property. This will progressively reduce dependence on foreign technology and content.
- vi. There must be an integrated and holistic approach for both planning and implementation of the national IT strategy, to take advantage of the crosscutting, multiplier impact of IT.

vii. Effective IT strategy requires coordination and cooperation by different stakeholders. Partnership among government, private sector and community should be encouraged at local community, national, regional and global levels to foster joint learning and sharing.

1.5 Guideline for a National IT Strategy

Based on the analysis of the strategies, development and achievement of some member and non-member countries, a Guideline is put forward to meet the objectives set forth by IDB. This Guideline is conceived to incorporate all the necessary elements and factors to be considered for an effective strategy. This Guideline, while not specific enough to be called a strategy, can serve as a framework to guide the member countries in their respective effort to formulate a comprehensive National IT Policy and programs. Guidelines for a National IT Strategy are depicted in the following diagram.



Figure 1. 2 : Guidelines for a National IT Strategy

1) Shared Values and Principles

It is argued that among the primary causes of the digital divide is the divide between the rich and the poor economies, which in turn is caused by policies and practices of mainstream development model that are based on a secular worldview or paradigm that places undue emphasis on individual freedom, the pursuit of self-interest and material wealth. Therefore, the starting point for GNITS is the inclusion of and conformity to the shared values and principles of Islam. Shared values include equity, justice, family and community, peace, knowledge and a holistic development of man. Guiding principles of trust, respect and care are required to build strong social network that is a prerequisite to a resilient digital and knowledge-based economy.

2) Vision and Objective

National IT vision and objectives aligned to the overall national development goals and strategies are crucial in establishing a realistic target for ICT development. To increase the chance for success, the ICT vision and goals should be developed by taking into consideration the local needs, culture and capacity. The paradigm for ICT and socio-economic development should be in harmony with Islamic (and universal) principles and a more holistic notion of knowledge and man's purpose. This will pave the way for goals, objectives and strategic programs to be more focused on community interests, real capacity building and empowerment, and hence more sustainable.

3) Strategic Pillars

Programs and initiatives must be conceived and carried out in several strategic pillars (building blocks) to realize the vision and objectives of the IT strategy. It should have interventions that cut across several pillars and are mutually reinforcing, thus fostering a development dynamic. While many countries may not have the resources to design and initiate programs in all these areas, nevertheless, they should be factored in the strategy.

- **Polices and Regulations** the foundation and first pillar in the strategy is the creation of enabling policies and regulations. Policies and regulations should be designed to encourage and stimulate growth of ICT by building capacity in all dimensions: supply, demand, and governance. ICT policies and regulations work side by side and to a certain extent overlap with technology, industrial, telecommunication and media policies. As an enabler of socio-economic development, ICT policies must also be consistent with education, social and economic policy.
- Human Resource Development skilled human resource to effectively use ICT, acquired or developed, is the second most important element that must be considered in ensuring that the strategy achieves its desired goals. In order to diffuse ICT in the economy productively, it is important to have a programmed approach to continuously produce and nurture the knowledge workers, technology users, and entrepreneurs.
- **ICT Infrastructure** ICT infrastructure implementation requires good planning as it involves high investment over a long period. Therefore, policies and regulation such as competition and deregulation should be seriously considered but cautiously implemented to build and manage the infrastructure. Without the right policies, regulatory frameworks and innovative business models, expensive infrastructure investment might become a burden to many IDB member countries, and consequently would not be sustainable.
- Content and Community the right ICT applications, content and community programs should be designed and implemented to accelerate and diffuse the uptake of ICT in the country. Content and community applications should be developed to promote the participation of local citizens, users, businesses and entrepreneurs. This will in turn develop local expertise and technologies in order to balance a country's dependence to foreign technologies and content. Carefully crafted content and community programs provide the platform to bond policies, skilled human resources and infrastructure to reap the social and economic benefits associated with rapid innovation in advanced ICT-based goods and services.

• Innovation Clusters (IC) – This is the linkage, networking and development of different but inter-dependent entities i.e. education, research and development, industries, financial institutions and supporting services to form a virtuous cycle of innovation and entrepreneurship. While conventional innovation system is usually established within a nation, this Guideline recommends IC to be established among IDB member countries i.e. regional Innovation Cluster. It is in this regard that Centres of Excellence (COE) as suggested in this study, should be central participants point for each IC. This clustering approach, with the support of other elements and strategic pillars, will give rise to healthy competition and cooperation among many member countries, leveraging on each other's strengths and competencies, and in effect establish a viable regional IT strategy e.g. Pan-Arab IT strategy.

4) Critical Success Factors

This study identifies three critical factors that must be present in a strategic programs for the IT strategy to be effective:

- Strong leadership and political will are needed to drive and champion the ICT initiatives through obstacles and challenges, as ICT development incurs high investment and long-term commitment.
- Participative change management is required to create awareness, secure commitment and ownership among key stakeholders needed to sustain the momentum of various programs. A participative, inclusive approach to change instead of a unidirectional approach is critical to ensure effective transition and alignment to the vision and principles of the Guidelines.
- The right **governance and management** structure and capacity must be established to ensure successful implementation of various programs and projects. This may include the need for a new administrative infrastructure and institutional framework, including a dedicated agency to plan and manage the implementation of the national ICT strategy.

5) Centres of Excellence

Centres of Excellence (COE) are organisations that have shown success in some of the strategic pillars and elements of GNITS. These centres can help provide expertise, knowledge and best practices in the various domain areas relevant to ICT development. Grameen Phone, for example, has shown its success in building telecommunication infrastructure that have benefited the poor, especially women in suburban Bangladesh. Multimedia Development Corporation have experience in successfully implementing content and community programs (called flagships) involving many stakeholders. The experiences and lessons gathered from the centres of excellence can be used as reference models to help meet the ICT development needs of other IDB member countries. Within the context of this Guideline, these COE can be the central point of coordination and collaboration to establish regional Innovation Clusters among IDB member countries.

Though the following list is non-exhaustive, it will provide a starting point for IDB to consider for superior coordination and better utilisation of the services and resources.

Organisation	Country	Focus of Excellence
GRAMEEN PHONE, Grameen Bank	Bangladesh	Infrastructure, content and community; Microfinance franchising business model for rural people.
IDSC – Information and Decision Support Centre	Egypt	Government information infrastructure, IT training.
Information Technology Association of Jordan (Intaj)	Jordan	Smart Partnership between Government and Private Sector in formulating and implementing their REACH initiative, a national IT industry development plan.
NIC – National Information Centre	Jordan	Network infrastructure, community development program, IT training, Information policy and standards.
CMC - Communication and Multimedia Commission	Malaysia	Policy, Infrastructure development, Regulation; Cyber laws; Managing convergence of IT, Communication and Broadcasting.
MDC – Multimedia Development Corporation	Malaysia	Strategic planning, Content and Community, ICT Entrepreneur development; Innovation Clustering.
NITC – National Information Technology Council	Malaysia	Policy advocate; ICT think tank, strategic planning; Content and Community.
Ministry of Education, and Ministry of Science & Technology	Pakistan	Human Resource Development; R&D policy.
KACST - King Abdul Aziz City for Science & Technology	Saudi Arabia	Fostering Research and Development, R & D Policy.
SESRTCIC – Statistical, Economic and Social Research and Training Centre for Islamic Countries	Turkey	Socio-economic research, fostering collaboration and cooperation.
DIC – Dubai Internet City	UAE	Infrastructure, Innovation Clustering.

Table 1.3 : St	uggested C	Centres of	Excellence
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1.6 Strategy Considerations

The generic model described above should be viewed as a strategic framework from which specific strategic objectives and programs will need to be matched to countries' requirements and capacities. Based on the methodology of this study (see Appendix D) using 2001 and 2002 data, ICT readiness level of the member countries is ranked. Although this study refrains from such demarcation, the member countries can generally be classified into three categories: marginalized countries,

dynamic adopters, and potential leaders. Countries belonging to a particular category will then require a different set of strategic focus and priorities in ICT development.

- **Marginalized countries** countries grouped under this category have to confront with greater challenges such as poverty, illiteracy and poor infrastructure. Since resources are very limited, the ICT strategy for these countries should be focused on creating awareness, developing human resources, and building basic infrastructure for business and communities. It is recommended that the strategy be specifically focused on few key sectors that will give high visible impact. Within these few sectors, focus should be on leveraging local community resources to meet localised needs.
- **Dynamic adopters** Key objective for this group is to build the ICT infrastructure capacity, demand and skills in the country in order to increase both the usage and development. This is done by embarking on programs that aim to diffuse IT and increase the critical mass of ICT users in all aspects of the economy e.g. lifting of barriers and impediments to ICT adoption, production and increasing access to Internet, knowledge and continuous learning.
- **Potential leaders** Many countries in this group have the necessary resources and infrastructure to implement broad based ICT development. At this stage, the countries' focus is to increase the effective use of ICT and knowledge in the high value-added activities market segments to increase productivity and competitiveness. Countries in this segment, while striking a balance in the five strategic pillars identified earlier, must focus on accelerating their ICT innovation, content and community programmes. This will enable the countries to apply and learn cutting edge knowledge and technologies, increase the supply side capabilities, rapidly move up the value chain of technology and become ICT innovator.

1.7 Role of IDB

Islamic Development Bank as the initiator for GNITS could play a catalytic role in encouraging the development of ICT in the member countries. Some of the initiatives that IDB may consider to undertake are as follows:

- ICT Development Fund for planning and implementation of ICT development programs.
- ICT Entrepreneur and SME development program to increase entrepreneurial and management skills in ICT.
- Advocacy for alternative development model that is more aligned to Islamic principles of fairness and social justice.
- Technology Venture Capital to provide seed and venture fund for new ICT businesses.
- HRD and ICT Education programme to encourage higher education in ICT and to assist member countries modernise their national curriculum to give emphasis to science, mathematics, and subjects relevant for the knowledge-based future.
- Grants for R&D/Content and Community projects to help fund research and development to provide content and applications for local communities.
- IDB can be a model IT user and Learning organisation to increase efficiency and productivity.
- Leverage on IDB's initiatives such as OICnetworks to encourage online communication, information sharing, learning, and trade among member countries.

1.8 Conclusion: Towards Collective Consciousness and Action

The development of this Guideline acknowledges that the knowledge-based economy enabled by ICT creates new opportunities for nations and communities. National IT strategies can no longer be pursued in isolation and must be positioned within the global scenario, while simultaneously addressing the needs and opportunities emerging from the local context, particularly the social, cultural, and spiritual conditioning of Muslims.

Hence, the leadership, private sector and civil societies of IDB member countries must work together to meet the challenges of the global, competitive and predatory forces while continuing to address the development needs of their local, domestic economies. IDB member countries must participate in the global debate and collectively provide an alternative vision required to bridge the divide. This global challenge requires a global response from IDB member countries.

The proposed Guideline is, therefore, essentially a strategic framework for joint learning and discovery, as any strategy to foster innovation and change should be. This is because the needs of the target communities in many IDB member countries can never be fully determined until the stakeholders involved act on initial ideas, strategies, and pilot projects. If this study and its proposed model are able to contribute to further discussion on possibilities and options, then it would be meeting its primary objective: to promote greater awareness on the importance of and opportunities through IT, and ultimately contribute towards the collective consciousness and action of the IDB member countries.

2. ICT REVOLUTION

t is widely acknowledged today that Information and Communication Technology (ICT) has become a means to improve the socio-economic condition and productivity of a country. It is a means that is universal as it can be applied and used in diverse ways: from basic automation and information sharing, to advanced research and development in areas such as agriculture, industry production, life sciences and education. This section highlights the evolution of ICT, its relationship to development, productivity, and globalisation. This section ends with the key characteristics of ICT, for this understanding is important for ICT to be included in any development strategy.

2.1 Technological Evolution

The ICT revolution was among the many chains of technology revolutions that have taken place since the Industrial Revolution. These waves of revolutions though, were not evenly distributed and were more of a periodic cluster that profits certain countries. These periodic clusters resulted in a rapid economic growth opportunities and radical social changes. These revolutions depend upon clusters of mutually supporting technological innovations being accompanied by social innovations in areas ranging from organizations and management to taxation and employment law. Figure 2.1 highlights these revolutions in a simplified form and describes the key factor industries associated with each wave. Factor industries, such as cotton, steel and oil, are typified by continually reduced costs, readily available supply and an impact across wide area of the economy.



Figure 2.1: Waves of Technological Development, 1770 – 1990

2.2 Evolution of ICT

The first major use of Information Technology (IT) could be said to have started with the introduction of early mainframe computers to respond to the needs of scientific research and government statistical data gathering and processing, where the technology helped to speed up results and forecasting. These techniques were later applied to the business environment where mainframe computers and robotics are used to automate business processes and number-crunching functions. From automation of business processes, IT was then applied to higher value-adding functions such as design, resource planning, sophisticated manufacturing and mission critical functions. Developments and applications of IT have stretched beyond imagination. Together with the rapid development and innovation in telecommunication technology and the Internet, this evolution has ushered in many new business models and applications.

ICT is robust that it can be harnessed in many ways that its true potential is limited only to the human mind. With ICT, physical borders dissipate as information move freely through the digital medium that is less controlled as compared to other existing mass media. Globalisation is said to accelerate and enabled by ICT, making markets bigger and more accessible by business with strong capital, management and technology. Businesses or e-commerce has started to be done virtually and transaction occurs at a click of a mouse anywhere and anytime. Scientific findings churn faster and newer discoveries and inventions as journals and reports are made available through ICT. The technology that began life as a faster way to process data and compute statistics has today become pervasive in almost all parts of our life.

2.3 Importance of ICT to Economic Development

Studies at the company and country levels have shown that information technology is positively related to corporate and national economic performance. Economic growth depends heavily on the efficient and effective use of the country's resources, which include land, capital, labour and increasingly today, knowledge and technology. Technological progress is stimulated by an attempt to respond to some unmet need, or by attempting to perform activities in a more effective and efficient way.

Technological innovation affects human development in two ways (see figure 2.2). Firstly, it can directly enhance human capabilities. Many technologies such as drought-tolerant plant varieties for farmers in certain climates, vaccines for infectious diseases, clean energy sources for cooking, Internet access for information and communication – directly improve people's health, nutrition, knowledge and living standards. It can also increase people's ability to participate more actively in the social, economic and political life of a community.

Secondly, technological innovation is a means to human development because of its impact on economic growth through increased productivity. It raises crop yields, factory output and efficiency of service providers and small businesses. ICT provides the tools to manipulate, organize and optimise the usage of available resources to increase productivity that in turn boost the country's economic growth and standard of living. IT spawns activities and industries – such as ICT sector – contributing to economic growth and employment opportunities.

Conversely, human development is also an important means to technology development. Technological innovation is an expression of human potential. Higher education contributes significantly to technology creation and diffusion. More scientists can undertake research and development and better

educated farmers and factory workers can learn, master and use new techniques with greater ease and effectiveness. And greater access to information and knowledge resources create conditions that encourage people's creativity.

Human development and technological advancement can be mutually reinforcing, creating a virtuous cycle. Technological innovations in agriculture, medicine, energy, manufacturing and communication are important – though not the only factors behind the gains in human development and poverty eradication. These innovations broke the barriers to progress, such as low incomes and/or constitutional constraints.



Figure 2.2: Technology and the building of human capabilities¹

2.4 ICT Industry

Besides being a tool to enable greater productivity and effective use of resources, ICT is also today a fast growing industry. While there has been a contraction in the ICT sector due to the burst in "the dotcom bubble" in 2000 and the economic recession in many economies due to global events in 2001, the global ICT marketplace is still growing, albeit slowly. The global market for ICT, as measured by spending, has jumped from US\$ 1.3 trillion in 1993 to \$2.4 trillion in 2001^2 . This represents a compound annual growth rate of 7.6% over this period. Internet transaction from around the world is forecasted to exceed US\$ 6 trillion by 2004^3 with 95% of the transaction originating from North America, Asia Pacific and Western Europe.

³ Source: Forrester Research

¹ Human Development Report 2000

² World Information Technology and Service Alliance (WITSA), *Digital Planet 2002: The Global Information Economy*

The development of the industry is still an ongoing phenomenon and it is poised to grow further as countries around the world continue to promote the growth of ICT through the creation and support of the policy frameworks, infrastructures, skill force, partnerships and applications.

ICT reaches a wide spectrum of activity that includes cultural, education, science and business. Application of ICT across vertical functions and activities means that there are limitless opportunities that can be exploited by countries to develop their respective economies and societies.

Many countries have acknowledged this fact and were taking serious actions to participate in the ICT economy as a path to economic success, in contrast to the emphasis placed on national selfsufficiency by many developing countries in past decades (see Figure 2.3). Countries that had previously pursued protectionist strategies to nurture industrialization, such as China, Brazil and India have lowered barriers to trade and foreign investment, and are privatising and deregulating important industry sectors. Consequently, Multi-National Corporations (MNCs) are increasingly investing in these developing countries for new markets and low cost production sites, creating new opportunities for those countries to participate in the global economy.



Figure 2-3: ICT spending in 1999 (in US\$ '000) in selected developing countries⁴

2.5 ICT and Productivity

Technology has long been held to contribute to economic growth through productivity improvement, but early studies of information technology (IT) investments and economic growth found no significant relationship. Indeed, despite large IT investments, national productivity growth in the United States declined in the 1970s and 1980s, leading some to call the situation a productivity paradox.

⁴ Source: World Information Technology and Services Alliance: Digital Planet 2000; MSCTC Analysis

The most persuasive theoretical explanation for the paradox is that IT investments generally have been too small a percentage of the inputs to the economy to have measurable effect.⁵

Research has indicated the direct relationship between the usage of ICT and the improvement in productivity can only be seen in the long term. The usage of MRP, CRM, databases, and office automation has proven to increase productivity by reducing production time and optimising the usage of other resources.

By the mid-nineties, IT investments had grown to 4-5% of GDP in many developed countries. In United States, for example, high level of investment in IT (equipment, software, services), which grew by a CAGR of 11% for the period 1987 to 1995 (see figure below), have helped to achieve an average annual labour productivity increase of 1.4% in the same period. For the period of 1995 to 2000, when the CAGR in IT investment averaged 20.2%, labour productivity growth reached 2.5%.



Figure 2.4: Growth in IT investment and productivity in USA⁶

These improvements in productivity are derived from the ability to innovate and deliver better products more efficiently, and the availability of skills and systems in the whole network of suppliers, distributors, and even the financial/payment institutions. The convergence of communications and computing further accelerates this process of innovation by increasing the rate at which new knowledge and technologies can be shared and exploited. Most importantly, productivity and overall competitiveness of a business or an industry will improve when the whole system – internal operations, linkages to suppliers, customers, regulators, and government – has effectively utilised or adopted ICT.

⁵ The Productivity Paradox of Information Technology: Review and Assessment, Erik Brynjolfsson, *Communications of the ACM*, December, 1993

⁶ Source: Bureau of Labour Statistics

2.6 ICT and Globalization

ICT is an instrumental tool in the rapid globalisation process because with high bandwidth telecommunication networking, integrated systems and databases, MNCs can build global competitive advantage by organizing resources and locating business units at places where it makes the most business sense. For example, a company can locate its manufacturing plant in places where the labour is cheap and its Research and Development (R&D) facilities in places where there are a lot of highly skilled professionals. Communication, control and decision-making are made possible with networks that link these far-away operations.

Countries such as Singapore, Taiwan, Thailand, Malaysia and Ireland have achieved rapid growth and development through this strategy of attracting Foreign Direct Investment (FDI). The benefits are not free, however, as there are other costs of liberalization to the economy and the society. In the short run, domestic companies can find themselves losing market share and viability to global competitors. MNCs may simply import goods to the local market without producing, exporting, or bringing in new technology. And if there were any production activities, they may only perform assembly work, creating jobs with very low pay and sometimes in poor working conditions. However, in the long term the resilient domestic company will see a high return on the time and money spent in developing its competitive advantage with ICT.

In addition to staying competitive in the domestic market, these global companies are also setting the stage for international markets. The global production networks of many industries (e.g., PCs, semiconductors, automobiles) are moving quickly to integrate the entire supply chain electronically. Electronic Data Interchange (EDI) was a first step, but now MNCs are linking their design, procurement, manufacturing, logistics and marketing through internet-based technologies. This new type of end-to-end system is commonly referred to as Supply Chain Management (SCM). Even low-technology industries such as textiles and footwear are following suit. Internet commerce will make it possible for even small companies in remote locations to market their products and services around the world.

In order to benefit from ICT and address the challenge of global competition, developing countries need to establish competitive advantage that is beyond cheap labour. These competitive advantages can be achieved through developing highly skilled human resource, laying world-class ICT infrastructure, institutionalising a web of R&D facilities, and nurturing strong entrepreneurial skills. Investments to develop these competitive advantages have been proven to be able to provide a more sustainable productivity-led growth. Those that have made the investments and developed the capabilities will benefit from globalisation, while those who have not will be left out.

2.7 Characteristics of ICT Development

The rapid rise of ICT, from its initial inception and applications to the current catalytic and enabling role, can be attributed to a set of characteristics of ICT itself, and to the dynamics of the market and society in which ICT was introduced. The understanding of these characteristics and the related market dynamics is critical for any organization or country formulating an IT strategy:

i. ICT is subjected to network externalities, which means that once a certain critical mass of users of an application or technology is reached, the network will experience exponential

growth as more users will be compelled to connect to it because of the relative ease to connect to others, get applications, training and support⁷. This further increases the value of the whole network, and competing networks or technologies will find it more difficult to establish another "standard".

- ii. ICT cuts across many sectors, industries, and even national borders. ICT has the potential to disintermediate established network and relationships between producers, distributors, dealers and end users. ICT has enabled the existence of new business models and whole new industries such as shared services e.g. Application Service Provider (ASP). In this regard, ICT is often *disruptive* to many established markets, economies and society, transferring value, wealth and power to new relationships and structures.
- iii. Successful application of ICT may come from unexpected sources. The history of many ICT innovations indicates that successful applications often arise not from the market for which the technology was developed, but due to the demand of a different or new market (a set of users). The first IBM mainframe was meant for the study of astronomy but found success in business payroll applications. More recently, the Internet that was initially only used by researchers and academics, is now a required technology for all types of businesses and institutions.
- iv. The best application often does not come from the best technology. Again, history is rich with cases of many great technologies that have failed to find a market. Successful applications, on the other hand, are usually built using technologies that are not necessarily leading edge, but packaged with support infrastructure, training, services, and most importantly, the ability to inter-connect and inter-operate with other applications and systems. In short, the best application is a real solution that meets the needs of the market.

The above characteristics and dynamics imply that planning for ICT means having to deal with uncertainty and risks. For a technology to be accepted by the critical mass (of mainstream users), issues about ease-of-use, standards and inter-operability have to be addressed, and they have to be addressed fast, in order to secure early-mover advantages. While ICT solutions need to be demand-driven, it cannot often be determined as to where that demand is coming from. The strategy for ICT therefore, needs to be opportunistic by being open to unexpected successes and failures, by incorporating plan for learning and discovery.

⁷ In IT, this is also referred to as Metcalf's Law, named after the founder of 3Com Corporation, who observed that the utility of a network (whether of telephones, fax machines, computers or people) equals the square of the number of its users.

3. CHALLENGES FOR IDB MEMBER COUNTRIES

he current state of Muslim countries, especially in ICT development, continues to lag behind many developing and developed countries. The opportunities for these countries to harness IT benefits and implement effective IT strategies could be hindered if challenges are not identified and ironed out in time. This chapter aims to discuss the major challenges and barriers.

3.1 Indicators of ICT Under-development

There are many indicators that can be used in assessing the level of ICT in a country. These indicators range from national ICT spending to the number of Personal Computers (PC) in a country (see Appendix D). For the purpose of the discussion in this chapter, the following indicators are presented:

- ICT Spending
- Internet Diffusion

3.1.1. ICT Spending

ICT spending represents the expenditure incurred by the government, private sector and individuals in the following components:

- a. Telecommunication infrastructure e.g. receivers, satellite, telephone lines, etc;
- b. Hardware equipments i.e. from computers and servers to communication backbone;
- c. Software i.e. office productivity software, network software; and
- d. Other services that are directly and indirectly associated with the ICT e.g. system support and technical consultation, including the cost of internal IT departments.

ICT spending in the developed countries is shaping the world's view on communication and information technology. As Figures 3.1 and 3.2 indicate, the ICT investment of even the most aggressive among IDB member countries, both in absolute term as well as relative to GDP, is significantly less than the world average, not to mention the average of the OECD countries. In 2001 itself, United States had spent approximately US\$ 812 billion or 7.9% of the GDP towards ICT, an amount 87 times bigger than Turkey's US\$ 9.3 billion¹.

¹ Source: World Information Technology and Services Alliance: Digital Planet 2002; MSCTC Analysis



Figure 3.1: ICT Spending of selected IDB member countries versus world average



Figure 3.2: ICT spending per GDP of selected IDB member countries versus world average

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More worrying is the lower rate of growth in ICT investment for most IDB member countries, as measured by the Compound Annual Growth Rate (CAGR), when compared to the world and OECD averages of 7.6 and 9.2% respectively for the period of 1993-2001 (see Figure 3.1)². At this rate of ICT development, the digital divide between the developed countries and IDB member countries will continue to widen. The exceptions are with Egypt, Turkey and Malaysia, where their respective CAGR of ICT spending from 1993 to 2001 is surpassing the average growth rate of both the World and OECD (See figure 3.2).

To the majority of IDB member countries, this widening digital divide means, among many consequences, an over dependence on technologies, standards and content from the developed nations. The over dependence will result in the member countries continuing to incur high investment cost on equipments and contents. Obviously, funding for ICT will remain a major challenge.

3.1.2 Internet Diffusion

Internet diffusion in member countries as measured in terms of the number Internet users and hosts is far behind if compared to other countries (see figure 3.3). Internet hosts refers to the Internet domain name that is registered under the country domain name e.g. my for Malaysia and sa for Saudi Arabia. In comparison to the OECD average, the average number of Internet hosts in the IDB member countries is at 0.5 percent, a very huge disparity. Even countries like Turkey and Malaysia, considered to be among the more developed IDB member countries, only accounted for 11% and 7% respectively of the OECD average. Australia has more about fourteen times the number of Internet hosts than that of Turkey.



Figure 3.3: Internet Users and Hosts in selected countries relative to OECD average in 2001³

² Data for the discussion in this section are obtained from World Information Technology and Services Alliance: Digital Planet 2002; (*All OECD except Luxembourg and Iceland) MSCTC Analysis

³ Source: Nua.com (<u>http://www.nua.com</u>) - 2001 data; MSCTC analysis

This huge disparity is also evident in the number of Internet user in the countries. Countries that have high number of Internet host will generally lead to higher number Internet users. Relative to the OECD average, the average for the total number of Internet users in all of IDB member countries is only 2%. For the Least Developed Member Countries (LDMC's) the average total number of Internet users is only at 0.1% of the average for OECD.

There are a few reasons that had led to the current situation. A common problem in the growth of the Internet is the telecommunication infrastructure. In Europe and other areas of the world it takes the form of costly per-minute charge for local phone calls. However, while developed countries have this problem as well, the primary problems for most developing areas are the lack of reliable telephone lines or the lack of the telephone lines themselves, in addition to costly local toll charges.

Limited bandwidth capacity and access to Internet-linked computers is another major challenge for many IDB member countries, especially those on the African continent⁴. The low speed of access hinders the establishment of web sites with a local domain name and many resort to have their domain name and host on servers in other countries such as United States or Europe.

3.2 Poverty and Illiteracy

Many IDB member countries, particularly the LDMCs are mired in the perennial problems of indebtedness, poverty, and poor literacy. These issues, and others relating to health and social conditions, constitute the basic societal infrastructure that needs to be established as a primary priority (see figure below). This primary priority presents many LDMC's with urgent challenges in striving to provide people with basic living conditions. As these countries must continue to channel their scarce development resources to deal specifically with socio-development issues, they are severely constrained to meet even the pre-conditions for ICT development. National ICT strategy and broader-based development will naturally take a backseat until certain pre-conditions are met.

<u>Secondary</u> <u>Priorit</u> y	Commercial & Physical Infrastructure	Basic ICT infrastructure				
		Political and Governmental Stability		ity	Basic Business Environment	
	etal ure	Gender equality & E women	Gender equality & Empowering De women		evelop a global partnership for development	
Primary Priority Priority		Improve maternal health	nal Basic literacy levels Ensure enviro sustainab		sure environmental sustainability	
	Bas infr	Poverty & Hunger	Combat HIV/A and other	IDS, mal diseases	aria	Reduce child mortality rates

Figure 3.4: Primary and Secondary Priorities - Pre-conditions for IT Strategy ⁵

⁴ African Internet Connectivity, Information & Communication Technologies (ICTs) Telecommunications, Internet and Computer Infrastructure in Africa, http://demiurge.wn.apc.org/africa/

⁵ Adapted from UNDP "The Millennium Development Goals", United Nations Millennium Summit 2000
3.3 Meeting Preconditions

Beyond the priority goals of reducing poverty and illiteracy i.e. the basic societal infrastructure, many member countries then need to establish the commercial and physical infrastructure as the secondary priority. This secondary priority constitutes what can be considered as the pre-conditions for the national IT strategy because they are fundamental for a sound business environment. The pre-conditions are:

- Basic Business Environment
- Political and Government Stability
- Basic ICT Infrastructure
- Skilled Human Resource

From economic point of view, basic business environment refers to developing an encouraging atmosphere for trade and commerce. This includes law and regulations, non-IT commerce and finance infrastructure, telecommunication, road and transport infrastructure, political and government stability, and the availability of human resources with the necessary business and technical skills. These factors are discussed below.

Firstly, it is important for countries to realize that the potential of ICT as an enabler to improve their competitive position can only materialize if IT initiatives also focus on developing local businesses, particularly the Small and Medium Enterprises (SME's). Otherwise the IT initiative may not be sustainable or viable over the long term. The key challenge for member countries here is the need to acquire knowledge and skills to manage and operate IT as a business, besides the ongoing challenge of developing the management, organisational and professional skills for other (non-IT) business.

Secondly, political and government stability refers to a country having consistent political leadership and commitment to guide the country towards political, economical, social and technological advancements. This high level leadership by the leaders and governmental bodies, coupled with strategic thinking and action of policymakers and industry leaders will help steer the country's national agenda towards utilising ICT to increase productivity and ultimately to realize the full potential of a knowledge-based economy.

Thirdly, basic ICT infrastructure is a prerequisite for the initial development of ICT. The infrastructure here includes power supply, fundamental telecommunication services (phones and faxes) and other related infrastructure, which will contribute to Internet connectivity and ICT adoption for a respective country. In the majority of IDB member countries, as highlighted in Section 3.1, ICT infrastructure is a major challenge because it is almost non-existent.

Fourthly, skilled human resource plays an important role in technology development. Skilled human resource with the presence of other enablers will help the country to adapt to the changes in technology and provide the talent pool for innovation. This pool provides the base of users who will grow in sophistication with their requirements, and from which the ICT suppliers can draw talents. In developed countries the focus on science and technology since the dawn of the Industrial Revolution has been the main driver of innovation and economic progress. The emphasis on science and technology, especially in education, is part of an innovative cycle that supplies the resources needed to generate new knowledge, technologies and innovations.

In summary, this secondary priority of the commercial and physical infrastructure must be viewed and developed as an extension of the above-mentioned basic socio-economic infrastructure. Obviously the goals and specific priorities to be attained by any member country will be heavily dependent on the country's objectives, direction, resources, culture and capacity. Once these primary and secondary priorities are fulfilled, the country can look forward to developing a more comprehensive IT strategy to increase productivity, competitiveness, and the knowledge intensity of its economy, thereby reducing the digital divide.

3.4 Social, Political and Cultural Factors

While the huge gap in IT usage and adoption in many member countries can be attributed to the problems of poverty, illiteracy and inadequate infrastructure, the lack of other vital factors contribute to the state IT underdevelopment in even the richer IDB member countries. While the lack of IT, strategic planning, and business skills is obviously a major issue that has been discussed earlier, other political, social, cultural and even spiritual factors need to be analysed and understood. Research has shown that societies tend to shun technological innovation when the innovation is perceived to be a threat to or incompatible with the values and interests that the societies hold dear. The following will attempt to explore these main factors.

- a) Besides the perennial problems of poverty and illiteracy, there are also scepticisms towards IT-related initiatives in the member countries⁶. Older generations and traditional societies were more concerned over the adverse effect of open information and external influences to the younger generation. The rich world of information and choices implicates either positive or negative elements based on differing interpretation.
- b) Political and government leaders in countries that have had little or no exposure to democratic process and institutions are certainly concerned that greater access to information and communication by the general public may lead to greater dissent. The tendency then is for the leaders and policymakers to restrict access to ICT and at best be overly cautious and very slow in providing access by the general citizens.
- c) From the broader socio-economic perspective, it is argued that among cause of the digital divide is the divide between the rich and the poor economies, which in turn is caused by policies and practices of mainstream development economics that are based on a secular worldview or paradigm that places undue emphasis on individual freedom, the pursuit of self-interest and material wealth. This is in stark contrast to the worldview, beliefs and hence the values of the majority of Muslim societies. The technological superiority of the west and its corollary market liberalization and domination through globalisation are viewed by many developing countries, especially Muslim countries, as threatening not only their social and economic viability, but also their cultural and spiritual identity. This has caused many Muslim societies and countries to pursue "isolationist" or even protectionist policies.
- d) Underpinning the above point, at the spiritual level, is the belief about knowledge and the purpose of Man. Behind the ICT revolution is the diffusion of knowledge in science and

⁶ Report on the Ninth IDB Annual Symposium on "Preparing The Ummah For The 21st Century: Promotion of Information Technology for Development", 1998, IDB

technology. Yet, science and technology, as measured by indicators such as the 'value added' in production, as a productive institution, and as a major element in a country's educational system, is glaringly weak in Islamic countries⁷. Again, it is argued that this scientific-technological underdevelopment has as its root cause, the chasm between the modern, scientific worldview of knowledge and that of the Muslim's. The modern conception of knowledge especially in terms of science and technology is based on a worldview that is too mechanistic, where Man is reduced to just being interested in pursuing knowledge in order to create wealth and to achieve greater social position. This worldview assumes that man's pursuit of knowledge and technology for self-interest will naturally result in benefits and wealth that will flow to the public. But the growing divide between the rich and the poor since the onslaught of the Industrial Revolution clearly shows that this assumption is wrong.

Clearly, it is difficult for many Muslim communities today to reconcile the values and belief underpinning the global capitalist system and its corollary, mainstream development model, with the worldview and values of Islam. For developing countries that have quite recently (a few decades) experienced the negative consequences of Western domination through colonisation, war, or the subtle erosion of cultural and spiritual identity as a result of globalisation's promotion of a hegemonic Westernbased consumer culture, they will quite naturally view ICT with scepticism, apprehension and even resistance.

Today, many leaders of developing countries, and especially the Muslim countries, have begun to realize that the digital and material divide is a manifestation of a flawed system benefiting the privileged few at the expense of the larger community. It is flawed because it assumes the pursuit of self-interest and will ultimately translate to public good but yet the system did not or could not enforce the principles of trust, respect, equity and transparency that are necessary to ensure optimal and just outcomes. It is hard for many member and non-member countries to equate the conformity to the universal principles that are in practice by the developed countries, largely from the West. The policies and strategies of the developed economies are largely influenced by their respective leading global corporations, enabled by ICT to search for new markets and cheaper sources of labour and resources, all in the pursuit of profit. These corporations behave this way because they are operating in the global capitalist system that values profit and the pursuit of self-interest over public interest, and letting the so-called "free" market to be the sole judge.

3.5 Overcoming the Challenges

The discussion set forth in this chapter highlights the daunting tasks ahead for IDB member countries with regard to reducing the digital divide. The factors causing the widening gap between the rich and the poor, and the consequential digital divide are multi-faceted. They range from basic social and economic factors to the more complex and yet subtle issues about beliefs and values. The cultural identity and authenticity of Islam and many member countries must be preserved or better yet, enhanced through development models that conform to ethics, morality, and the basic principles of religion.

Hence, the first step for many IDB member countries is to really understand the root factors and the implications of underdevelopment in education, science and technology. This understanding and the

⁷ Extracted from "Islam and Science" by Pervez Hoodboy (1992), especially Chapter 4.

desire to address them will potentially call for the necessary reforms in education, economic, political and social spheres to reconcile the worldview and beliefs underpinning these systems. While mainstream development approaches have weaknesses resulting in the imbalance in wealth distribution and the degradation of the environment and living conditions in poor countries, many Muslim societies' rejection of the scientific and rational mind because they are deemed secular or worst still, un-Islamic must also be thoroughly re-examined. These reforms constitute the biggest challenge, but they are necessary to make science and its rational approach to knowledge compatible with Islam. If they were not compatible, then surely Islam during the peak of its civilization could not have made significant and lasting contribution to science, notably in mathematics and medicine.

To conclude this discussion, the question for many IDB member countries is no longer about trade-offs or waiting for all pre-conditions to be met before embarking on national ICT strategies. There is an urgent need to overcome all these challenges in parallel, with priorities and resources rightly assigned. In other words, IDB member countries need to be strategically focused.

The next chapter will discuss the possible strategic approaches at the socio-economic level that the member countries can adopt for ICT development in tandem with attempts to address the above set of challenges in the social, political and cultural spheres.

4. OVERVIEW OF STRATEGY ANALYSIS

entral to the understanding of various IT strategies covered in this study are the basic thrusts and approaches that can be employed for strategic planning and development. Since the 1980's, some farsighted developing countries have started formulating and implementing national-level ICT programs with 2 distinct approaches (see figure below). These approaches are:

- ICT as a production sector.
- ICT as an enabler of socio-economic development.



Figure 4.1: Different Strategies Adopted by Countries¹

4.1 ICT as a Production Sector

With ICT in itself constituting a global and fast growing industry, targeting and developing it as strategic production sector has become the cornerstone of many developing countries' IT strategy. This approach involves policies that focus on the development and promotion of ICT-related industries such as

¹ United Nations Development Program, Creating a Development Dynamic, final report on digital opportunity initiative, July 2001

computer hardware, software, telecommunications equipment and ICT-enabled services. This usually involves a combination of competitive tax regime and a high pool of skilled and semiskilled labour strategy that is designed to attract foreign investment to establish ICT, electrical and electronic industry.

This method provides a good starting base for many countries, especially those that have high number of cheap semi-skilled labour, to develop an ICT presence. Employment opportunities are increased when manufacturers engaged in labour intensive activities e.g. wafer assembly and electronic components production, set foot in the country with the right competitive advantage and incentives.

Evidence of the value of ICT production in the United States, documented in a 1998 report by the U.S. Department of Commerce, estimates that ICT industries accounted for 7.5% of the U.S. economy and 15.8% of GDP growth in 1996. Similarly, other countries have had equally impressive results from ICT production. The ICT industry is a major source of economic output, exports and jobs in countries such as Taiwan, Singapore, Hong Kong, Malaysia, Korea and Ireland.

Within this approach, there can be two different but not exclusive focus areas. One is to develop the sector to promote export of ICT products and services while another focus is to develop national capacities. Nevertheless, sustainability is the key to be competitive in this strategy of developing the ICT production sector. Manufacturers in their bid to be competitive and cost effective will be attracted primarily to tax incentives and cheap labour. Emerging country such as China and India are attracting high number of foreign investments due to the availability of these factors.

This trend has forced many developed countries and some fast developing countries to reconsider their strategy. Many have shifted their focus towards the higher value added activities in the value chain that can provide higher returns and whose advantages – in the form of innovation, patents, productivity, R&D and differentiation – are more sustainable.

4.2 ICT as an Enabler of Socio-Economic Development

The approach of utilising ICT as an enabler involves the adoption of more holistic, cross-sector strategies aiming to harness the uniqueness of ICT to accelerate a wider development process. Within this basic approach, one strategic thrust can be the use of ICT to enable the restructuring and hence the competitive global positioning of a nation's economy. The Multimedia Super Corridor (MSC) program in Malaysia is adopting this approach, focusing on ICT and multimedia as a new engine of economic growth.

The other focus within this approach is to deploy ICT to specifically achieve development goals in domains such as education, healthcare, and public sector. The following cases illustrate the use of ICT as the enabler to achieve specific socio-economic development goals, contributing to education, economic productivity, ICT infrastructure, healthcare and sustainable development.²

Education

ICT (such as networks and the internet) in developing countries has usually started in the university and research community where its impact has been positive. For example, a survey undertaken in Ethiopia, Uganda, Zambia and Senegal on the impact of electronic communication technology shows

 $^{^2}$ Shirin Madon (1999) "The Internet and Socio-economic development: Exploring the interaction", London School of Economics **42**

that academic and research institutions have been able to conduct joint projects effectively, improve resource mobilisation, and carry out research between distant sites inexpensively (NRC, 1996).

Successful examples of the use of ICT for primary and secondary schools can be found in Cuba and Chile. Both countries have strong records of investment in human capital and have continued allocating resources to education networking. In 1992, a university in Chile embarked on a five-year project to develop and evaluate an elementary school network. Today, there are 144 networked schools each having between 3 and 10 computers and an Ethernet, some gaining connectivity to the Internet. The ICT network provides a variety of services – student and teacher newsletters, educational software, curriculum notes, computer conferences, e-mail, and access to databases. An evaluation of the network showed that it has had a significant effect on student creativity. With World Bank funding, the goal is to reach all secondary schools and half of all primary schools in the country by 2000.

The school networking project in Cuba began in 1987 and stressed grassroots participation of schools in rural areas. As of 1996, there were 150 centres spread around the country, 80 of which have modems used to dial into PCs running Unix in Havana for onward connection to the Internet (Press, 1996).

In Uganda, the World Bank has provided three secondary schools with Internet connectivity. This move has improved the teaching and learning activities in these schools. (See Box 4.1)

Uganda

In July 1996, Uganda became the first country to benefit from a world Bank project when three secondary schools were provided with Internet connectivity. The purpose was to introduce students to computers and the Internet, use the Internet to teach students about projects between schools inside and outside Uganda, and allow teachers to exchange experiences. This School-to-School Initiative was later transformed into a more ambitious Bank program known as World Links for Development (WorLD) (<u>http://www.worldbank</u> org/worldlinks/english/html/uganda.htm).

The WorLD objective is to establish a network linking students and educators around the world. Some 320 schools in 15 developing countries are currently participating in WorLD. In Uganda, WorLD has expanded to 20 schools and has ambitious plans to connect all the nation's schools.

The WorLD project in Uganda has been held back by infrastructure, human and social limitations. There are limited number of computers per student, restricted time for using the dial-up telephone, and electrical outages. Usage is primarily e-mail and searching the internet for information. The use of the Internet to teach subjects has not been fully realized, partly due to a lack of trained staff as well as the limited connectivity time (only one free hour a day). One result is that 'off-line' CDs such as Microsoft Encarta are used quite extensively. The project has also created a cultural revolution of sorts, pitting traditional teaching methods against interactivity and experimentation. For example, a number of schools do not allow students to use the computer labs during class times because they feel youngsters should concentrate on

the traditional national curriculum and focus on exam oriented results. On the other hand, teachers have been learning computer skills from students who are less inhibited about grasping new technology.

The program has proven popular with many parents who feel it adds to the prestige of the school and teaches important skills. The parents have been willing to pay extra to cover the cost of operating and maintaining the computers. One irony is that there has been significant digital exploration and collaboration with schools abroad yet very little interaction between the Ugandan schools.

Box 4.1:Uganda School-to-School initiatives³

Economic productivity and infrastructure development

Commercial connection is one of the basis for economic productivity as more and more companies are establishing closer links with customers, business partners, vendors and information resources. It follows that the better linked a country is to her economic partners (internally and externally), the better the potential to enhance economic development. ICT vehicles such as the Internet have clearly demonstrated their value in enhancing global and local presence to market products and services, hence improving economic productivity. When economic activity develops, business will invest more into providing better service and products to their customers; and these investments will help fund infrastructure development such as better Internet connection.

Health

A good example of how ICT investments can provide payoffs in the healthcare sector is the HealthNet project. HealthNet links healthcare workers in 16 African countries and 4 Asian countries with each other and with colleagues and databases in developed countries using a variety of Communication protocols (Panos, 1995; Panos, 1998). The network provides e-mail, a list server, electronic publications and database access to help and enhance healthcare services for poorer communities.

Another example is the Programme for Monitoring Emerging Diseases mailing list established during the Ebola virus outbreak in Zaire 1993. The network has over 1600 members in 80 countries. The list first heard of the outbreak in 1976 and circulated information from various international health organisations. Information was passed to and from affected countries, helping to control the spread of the virus and to treat the disease. For example, Zambia was able to use the Internet to check details about similar cases in the Copperbelt region of the country (Press, 1996). In general, most connectivity that takes place in HealthNet is from developing countries to information resources in developed countries.

Poverty alleviation

Electronic communication can assist in the management of crises and in poverty alleviation. One such effort is the Greater Horn of Africa Electronic Communication Network project that aims to link member states of the region in order to exchange crisis related information. Another potentially beneficial

³ International Telecommunication Union, The Internet in an African LDC: Uganda Case Study, January 2001. 44

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area for the application of electronic networks relates to the problem of food insecurity in Africa. One of the main problems characterizing the African economic situation is food insecurity, which contributes to local competition for resources between groups often resulting in civil war. Electronic networking can deliver critical information to farmers, extension workers and researchers fighting crises caused by famine (Adam, 1996; Panos, 1998). In terms of poverty alleviation, the Village Internet Programme of the Grameen Bank in Bangladesh aims to promote poverty alleviation by reducing migration from villages to cities, creating IT-related job opportunities for the rural poor, and by creating familiarity with computers among the rural population of the country.

Another example is the Honey Bee network established in 1990 as a pilot experiment in India. This electronic network aims to create a repository of indigenous knowledge and to link knowledge-rich grassroots innovations within a region in order to promote activities within poor communities that are both economically and ecologically viable.

4.3 The ICT Hubs

The 1990's have witnessed significant growth in the development and establishment of several ICT hubs in developing countries. Today, the creation of ICT hubs form an integral part of many countries' ICT initiatives. These hubs or technology parks are usually areas that have been designated as special economic zones for ICT to be developed with the aim to attract global companies to build their base and nurture local ICT entrepreneurs. This strategy was conceived to emulate the success of Silicon Valley in San Jose, California and Boston route 128 in spawning leading ICT companies that continue to shape the course of the industry today.

Silicon Valley's success was due to the confluence of many factors: the link of education, R&D and culture/environment that encourage risk taking and the important role of government big spending in ICT. Silicon Valley has the advantages of world-class academic institutions i.e. Stanford University, The University of California at Berkeley and California Institute of Technology, brilliant scientists, military procurements of semiconductors and the pleasant climate of Northern California. Most important of all was the significant demand for high technology systems coming from the military installation in the area.

The success of Silicon Valley had prompted many countries to understand the effect of ICT to the United States' economy, and several countries followed suit in designating their own ICT hubs as part of their strategy to develop IT production capabilities, capacity, and world-class companies to compete in the global economy. Nokia and Satyam are examples of world-class ICT companies that emerged from the ICT hubs in Finland and India respectively. Some of these hubs were created with a specific target industry in mind e.g. telecommunication, whilst others target broader range of industries e.g. Malaysia's Multimedia Super Corridor and Dubai Internet City aim to attract multimedia and software industries. With the dotcom bubble burst in 2000 some hubs have re-evaluated the economic condition and expanded its focus to include other new technology e.g. nanotechnology and biotechnology.

Some of the major technology hubs in various parts of the world are shown in the following table.

Country	Global Hubs	Specialisation
Australia	Melbourne Queensland Victoria	Information Technology,
Australia	Werbourne, Queensiand, Victoria	Telecommunication
Austria	Graz	Automotive, Pharmaceutical
Belgium	Flanders, Ypres	Communication
Brazil	Sao Paulo, Campinas	ICT
Canada	Montreal	Multimedia
China	Pudong, Shanghai	Information Technology, Electronic, Telecommunication
Finland	Oulu, Helsinki	Telecommunication
France	Paris, Grenoble, Strasbourg, Nice, Toulouse, Poitiers, Sophia Antipolis	Information Technology, Manufacturing services
Germany	Bavaria, Baden-Wurttemberg, Saxony, Jena, Dresden	Information Technology, Biotechnology, Environmental Technology
Hong Kong	Cyberport	Electronic
India	Bangalore, Hyderabad	Software, Off Shore Development
Ireland	Dublin, Citywest	Electronic and ICT
Japan	Tokyo and Kyoto	Electronic, Telecommunication
Korea, Rep. Of	Inchon	Multimedia
Malaysia	Multimedia Super Corridor, Cyberjaya	Multimedia, ICT
Norway	Trondheim	Mechanical, Chemical technology
Philippines	Subic Bay	Manufacturing, Information Technology
Singapore	Singapore	Electronics, Biotechnology
South Africa	Gauteng	Automotive and Information Technology
Spain	Barcelona	Information Technology
Sweden	Stockholm	Telecommunication
Taiwan	Hinschu, Taipei	Information Technology, Manufacturing services
Thailand	Bangkok	ICT
Tunisia	El Ghazala	ICT
United Arab Emirates	Dubai Internet City, Dubai Knowledge village, Dubai Media City	Information and Communication Technology
United Kingdom	London, Cambridge, Glasgow – Edinburgh, Thames Valley	Information Technology, Telecommunication, Biotechnology
United States	Silicon Valley, Boston, Raleigh-Durham- Chapel Hill, Austin, San Francisco, New York City, Albuquerque, Seattle, Los Angeles, Virginia, Chicago, Salt Lake City, Santa Fe	Telecommunication, Biotechnology, Electronics

Table 4.1: IT Hubs⁴

⁴ Source: MSCTC analysis

4.4 Review of Selected Member Countries' IT Strategy

Despite the obstacles and challenges that impede ICT development in many IDB member countries, a few have boldly embarked on national IT programs over the last few years. Countries such as Malaysia and United Arab Emirates have invested in mega ICT hubs, The Multimedia Super Corridor and Dubai Internet City respectively, in their bid to develop industry and capabilities, and attract investment in ICT. Pakistan⁵ and Bangladesh⁶ have published their own ICT plans and strategies; Egypt, Jordan and Bahrain have assigned specific government agencies to plan for and oversee their respective national IT program.

These initiatives are now beginning to make an impact on the respective countries' economies, and lessons can be drawn to serve as potential reference model. The following table highlights the important focus areas of the IT strategies of IDB member countries analysed in this study. A more comprehensive description and discussion is provided in Appendix A.

Selected IDB Member Countries; ICT Strategy and Program

Malaysia		
Strategic focus: As enabler and sector		
Malaysia has 2 national ICT programs:		
 National IT Agenda (NITA) 		
 Multimedia Super Corridor (MSC) 		
NITA's vision is to utilise ICT to transform all of Malaysian society into a values-based knowledge society. NITA views ICT development from three angles – people, infostructure and applications. With government funding though the Demonstrator Application Grant Scheme (DAGS), many community-based initiatives have been launched under NITA.		
The better-known MSC program consists of many inter-related programs, policy, Cyberlaws and incentives aimed at creating the most conducive corridor to attract world-class companies, as well as nurture Malaysian ICT companies to produce products for the global market. Among the most visible success of the MSC is the spawning of products and talents from several of its Flagship projects, namely:		
Electronic Government Telehealth Smart School Multipurpose Smart Card E-Business cluster		
As a result of both programs, Malaysian ICT industry has seen robust growth despite global slowdown, and the ICT penetration is among the highest in the developing world and Muslim world.		

⁵ Government of Pakistan, *IT Policy and Action Plan August 2000*, Ministry of Science & Technology

⁶ Government of Bangladesh, *IT Policy of Bangladesh*, Bangladesh Computer Council (BCC)

United Arab Emirates

Strategic focus: Sector; Infrastructure; Integrated Hub

UAE's ICT development has been largely spearheaded autonomously at the emirate level, especially Dubai, and more recently Abu Dhabi.

Dubai Internet City (DIC) and Dubai Media City (DMC) were launched in 1999 to attract global ICT companies to take advantage of Dubai's strategic location as the hub to the Middle East region. The incentives (tax and ownership policy) are really tailored to attract world-class companies.

DIC is the Middle East's largest ICT infrastructure, and has the most extensive commercial Internet Protocol telephony system in the world, as well as its own satellite station and its own Internet feed.

DMC is fast becoming a global media city. It is already home to over 550 media companies including global giants such as CNN, Reuters, Sony Broadcast & Professional, McGraw Hill Publishing, Bertelsmann, and MBC, along with regional companies and new start-ups.

The DIC has recently started the development of the Knowledge Village, now being built next to the 400-hectare DIC and DMC. The village is planned to set standard for an industry-oriented learning method through providing infrastructure for developing, sharing and applying knowledge.

The Dubai government is very committed to utilizing IT. It started the development of electronic government and established tejari.com to service b2b e-commerce transactions.

Egypt

Strategic focus: Software Sector; Infrastructure; Integrated Hub

The government of Egypt marked its commitment to IT with the establishment of the Information and Decision Support Center. The aims of IDSC are to:

- 1. Support Cabinet decision-making process in socio-economic development
- 2. Manage the development of the software and hi-tech industries
- 3. Act as catalyst for building Egypt's information infrastructure
- 4. Provide specialized IT education and training

The government also established the Regional Information Technology and Software Engineering Center) and later on, in partnership with others, the Regional Arab Information Technology Network (RAITnet) as part of its strategy to be a regional leader in the software sector skills.

Further development of IT is enabled with tax incentives, excellent infrastructure, and the creation of four technology parks:

- Sinai Technology Valley (STV)
- *City of 6th of October*
- Nag Hammady
- Sohag

STV in particular, aims to attract international investment in many critical industries such as Information Technology, Communication Technology, Medical Technology, Industrial Automation Technology, Biotechnology, Environmental Technology, and many other areas critical for development into the twenty first century.

Egypt's ICT sector is one of the largest in the Arab region. Today, Egypt has a strong regional presence in the software sector, by virtue of its qualified workforce and experience in the Arabization of content to suit local and regional needs.

Saudi Arabia

Strategic focus: Infrastructure; security

The government of Saudi Arabia has modernized the telecommunications network infrastructure; privatised the telecommunications operator. It has long enacted laws protecting Intellectual Property (IP): Trademark Law (1984), Patent Law and Copyright Law (both in 1989). Enforcement, however, has not been as strong as it should be.

Saudi Arabia's King Abdulaziz City for Science and Technology (KACST) has established a good track record as a technology research centre. Although initially focused on petroleum sector, it now includes astronomy, atomic energy, computer and electronics.

The National IT Plan Project was launched in late 2001 to formulate the IT Plan and programs. NITP comprises of representatives from government, academia, and private sector. The project team reports to the Ministry of Interior, which suggests that IT strategy and programs will be focused on internal security and content management (Saudi government censors all Internet inflow).

The NITP is a 5-year plan. Its current objectives include the promotion of IT industry, use of ecommerce, creation of jobs, better provision of telecommunications services, and improving education. At the heart of the proposed plan is the establishment of an independent body to manage, regulate and implement the National IT Plan. Since the plan is very new, there has not been significant progress or impact.

Bangladesh

Strategic focus: As sector and enabler

Bangladesh is a model for many LDMCs with its commitment to ICT development and market liberalization. The liberalization policy has enabled telecommunication services to reach many urban and rural areas. It's vision is to become "an IT-driven nation comprising knowledge-based society by the year 2006".

The National Council for IT (NCIT) was established to formulate policy, promote and facilitate use of ICT in all sectors of the economy for transparency, good governance and efficiency. The software sector has been given a lot of support via low interest financing, duty-free imports on hardware, warehouse facilities, and grants.

Bangladesh's program is also noteworthy for its partnership with the private sector, inclusion of NGO's, rural communities and even skilled Bangladeshis working overseas.

As a result, an export-oriented software and data processing services industry has begun to emerge. Other signs of progress include the increasing demand for IT products, greater number of learning institutions and IT-trained graduates. The partnership with private sector has enabled enterprising women to participate in ICT program and generate income – the Grameenphone Village program being the best example.

Guinea

Strategic focus: As infrastructure for social integration

Guinea started to liberalize its telecommunications sector many years ago to speed up infrastructure development. To date, many of the telecommunication services are provided by private companies, mostly in the form of joint ventures with foreign companies.

With the help of external funding, several initiatives to improve access have been implemented. Internet access is now available in main towns and some rural areas. There is also a strong policy push for education, to increase general schooling enrolment and literacy.

Despite these efforts, the ICT infrastructure remains very under-developed. There is no presence of IT industry. Guinea still has a long way to go in its development of human resources, infrastructure, and other socio-economic dimensions.

Jordan

Strategic focus: Infrastructure and sector

The government of Jordan is pursuing liberalization and reform in its effort to transform the economy to take advantage of its young educated workforce. It has long established the National Information Center to develop and manage the national information infrastructure, especially for the public sector. The recent establishment of the Ministry of Information and Communication Technology (MoICT) has helped accelerate and focus the development effort. Several legislations relevant to support ICT development have been enacted.

Jordan's main national IT program is the REACH program, a result of the close collaboration between the government, private sector, and community. It is a 5-year plan that specifies action in Regulatory Framework, Enabling Environment and Infrastructure, Advancement of National IT Programs, Capital and Finance, and Human Resource Development.

The REACH program laid out a clear plan of action to bolster the country's nascent IT sector and to maximize its ability to compete in local, regional, and global markets. The plan has the following goals to be reached by 2004:

- Generate 30,000 IT / IT-related jobs
- Achieve \$550 million dollars per year in software and IT exports
- Attract \$150 million dollars in foreign direct investment.

To date, the IT industry has benefited from the national initiative. Software export for 2001 was estimated to be US\$38 million from total industry revenue of \$168 million. This is very noteworthy for a small country like Jordan.

Table 4.2: Overview of Country ICT strategy and impact

4.5 Lessons Learnt from ICT Initiatives

Several lessons can be drawn from the ICT initiatives of the above selected member countries as well as the various initiatives in other developing countries whose case analysis are available from public sources. The following are the main lessons relevant for national IT strategy.

- 1. The governments in IDB member countries need to play a central and catalytic role in sustainable ICT development because the market and infrastructure in most countries are underdeveloped. Even if liberalization is pursued, ICT access by the rural citizens will not be achieved without government intervention in the form of special subsidies, tax, or the pooling of the private sectors' profit/revenue into some form of a universal service fund.
- 2. Focusing and developing ICT as a production sector can provide benefits in the short-term in the form of employment and local production of computer or telecommunications hardware. Hence the benefits are more visible than employing ICT as socio-economic enabler. However, other potential benefits such as the overall impact on economic growth, improvement in balance of payment, in increasing value-add to industry, and in creating highly-skilled, high-paying jobs, will take many years and hence require long-term commitment. For example, the software export industry in Bangladesh and Malaysia has only recently brought tremendous improvement in economy, by attracting foreign investment and creating new jobs.
- 3. Related to the above point, while the focus on ICT production sector will benefit the industry, there is little impact on the broader development of national infrastructure and capacity. This is especially true in the short to medium term, primarily due to the lack of immediate incentives to focus on infrastructure for domestic market. Hyderabad and Bangalore in India are cases in point, where even after more than a decade of success in software export, job and value creation, and in infrastructure development, there has been minimal impact in many other parts of the country.
- 4. Focusing on ICT as an enabler for socio-economic development should be applicable to most if not all IDB member countries, as studies have shown that this approach can increase productivity throughout the economy. However, this approach requires a long-term view and commitment, and initiatives must have clear development goals and objectives. The strategies that have been effective among IDB member countries and other developing countries are where initiatives are conceived and implemented with a business-case approach i.e. they need to have plans and strategies, with clear milestones and Key Performance Indicators (KPI's) to be viable and sustainable over a long period.
- 5. While infrastructure and human resource development are crucial for ICT adoption and diffusion, they are not sufficient. To create maximum impact, ICT strategy should also include investment and interventions to generate demand, build capacity at both the community and institutional levels, and foster an environment that encourages entrepreneurship and innovation.
- 6. Investing in and increasing ICT research and development will increase the local content, intellectual property, and integration for domestic ICT goods and services. This is useful to meet the local needs and compel users and communities to use ICT. Otherwise, the country

will continue to depend on foreign content and technology, and ICT development programs will tend to focus on only those segments of society that are educated and can afford foreign technology.

- 7. National level ICT program is a long-term undertaking and this requires strong vision and leadership. The country analysis indicates that such program, if properly conceived and implemented, could boost diffusion and create beneficial effects such as developing capabilities, more jobs and spin-offs in businesses.
- 8. For both planning and implementation, member countries would do well by taking an integrated and holistic approach to ensure synergistic deployment. The priority areas are in developing human resources, formulating clear and consistent policy, developing content and applications that fulfil local needs, and in fostering a climate that welcomes change and innovation.
- 9. For the IT strategy to be effective, the planning and implementation would need to recognize the important roles played by different stakeholders, and the need for a mechanism to coordinate, discuss ideas, resolve issues and seek consensus. ICT development requires coordination and involvement from a wide range of interested parties through strong leadership and properly structured mechanism to promote broad based participation. This *smart partnership* among government, private sector and community should be encouraged and promoted, not just at the national level, but also at the regional and global levels. The partnership will foster joint learning and sharing, especially among IDB member countries, to leverage on the competitive advantage of each respective country.

5. ELEMENTS OF AN IT STRATEGY

B ased on the analysis of the strategies, development and achievement of some member (see appendix A) and non-member countries, a Guideline for a National IT Strategy is put forward to meet the objectives set forth by IDB. The Guideline is conceived to incorporate all the necessary elements and factors to be considered for an effective strategy. While this Guideline on its own is not specific enough to be utilised as an executable strategy, it can serve as a useful and strategic framework for policy makers and planners in IDB countries to formulate their respective National ICT plan. With this Guideline, member countries can chart out a more realistic vision and actionable initiatives and have a better chance of bridging the digital divide.

The Guideline, illustrated below, comprises the following elements:

- 1. Shared Values and Principles
- 2. Vision and Objective
- 3. Strategic Pillars
- 4. Critical Success Factors



Figure 5.1: Elements of a National IT Strategy

5.1 Shared Values and Principles

If the basic aim of the Guideline for a National IT Strategy is to encourage member countries to be open to new learning, knowledge and possibilities enabled by IT, then the starting point for the planning and development of an effective IT strategy must be with the inclusion of and conformity to the shared values and principles of Islam. While the spiritual belief and worldview about Man's purpose, the unity of God, and concept of knowledge are unique to the religion of Islam, the values and principles that Muslims hold dear are common to many societies of the global community. These common and shared values are:

- Equity and justice
- Family and community life
- Universal peace
- Knowledge
- A more holistic well-being of man, encompassing not only the physical, intellectual and material wealth but also spiritual and cultural

With regard to principles, the Muslim societies also value and need policies, practices, processes and systems that abide by the principles of trust, respect and fairness. These universal principles that have served to build strong social, spiritual and cultural connections of civil societies of past and present should also serve to build the vibrant digital, knowledge economy. In fact, trust and care for community and public interests are essential for a market to be really efficient, to be truly 'free'. They are required if Muslim communities are to be encouraged to learn, communicate, and do business in new ways, across networks, and often with unknown people in other countries. Trust and care must be present if the IT strategy is to foster innovation, embrace change, manage risks, and diffuse knowledge and technology.

Digital networks ride on top of social networks, rather than replacing them. Without the trust, reciprocity, and community that the social community provides, a digital pipeline of virtually unlimited bandwidth will be useless."

Francis Fukuyama, in Trust: The Social Virtues and the Creation of Prosperity

Box 5.1: The need for trust in the knowledge economy

5.2 Aligned Vision and Objectives

An inspiring vision coupled with a set of realistic objectives form the next integral part in the development of a national ICT strategy, providing the nation's government, businesses, and citizens with a common end destination (vision) and the guiding posts or milestones (objectives) against which programs will be measured. National IT vision and objectives that are aligned to the overall national development goals and strategies are crucial in establishing a realistic target for ICT development. This has been illustrated in many of the successful ICT initiatives, be they at the local or national level.

Vision of IT Policy of Bangladesh:

"an ICT-driven nation comprising of knowledge-based society by the year 2006. In view of this, a country-wide ICT-infrastructure will be developed to ensure access to information by every citizen to facilitate empowerment of people and enhance democratic values and norms for sustainable economic development by using the infrastructure for human resources development, governance, ecommerce, banking, public utility services and all sorts of on-line ICT-enabled services"

Box 5.2: Vision of IT for Bangladesh

To increase the chance for success, the ICT vision and goals should be formulated by taking into consideration the local needs, culture and capacity. Especially for IDB member countries, the national vision and overall development goals must be conceived from a worldview or paradigm that is in harmony with and encompasses Islamic principles, its more holistic notion of knowledge and Man's purpose. This alternative vision must attempt to reconcile the Muslims' belief about knowledge, natural resources and man's purpose on earth with the need for development in all aspects of Muslim life: physical, economic, political, spiritual and social. The vision and its associated objectives must be guided by Islamic and universal principles of justice, trust, respect, and community/public interest above self-interest. A vision based on the shared worldview, purpose and values of Muslim will have a chance to touch the Muslims' hearts and minds, raise their consciousness, and thus empower them to act, acquire knowledge and technology.

Once the overall national vision, development goals and the resulting model are aligned to the Muslim communities' values and needs, the national ICT strategy can be formulated to enable and even accelerate the progress towards those development goals. ICT should be envisioned to provide the means to link local communities, national and regional economies, and ultimately the global network economy to foster collaboration towards development goals.

Subsequently, each IDB member country will have to determine the best approach and strategic focus to achieve the desired goals and objectives. Depending on the capacity and readiness of the country, the strategic focus can include the development of ICT as a production sector or as the enabler to achieve a higher level of socio-economic prosperity. In some countries, it is possible to focus on both strategic thrusts.

While the vision and strategic focus provide the long-term goals and help build consensus on national priorities, there is also a crucial need to set short and medium term objectives that are realistic and will provide quick, positive impact or win for the key stakeholders. Quick win, high impact initiatives within the context of the longer-term vision are necessary to maintain commitment and momentum towards broader development goals. Again, this will call for the envisioning and objective-setting process to be inclusive and sensitive to the needs of the stakeholders, especially the end user communities. This will pave the way for the goals, objectives and strategic programs that will be more focused on community interests, real capacity building and empowerment, and hence more sustainable.

5.3 Strategic Pillars

To realise the ICT vision and objective, several interventions in the strategic pillars (see Figure 5.2) need to be designed and implemented in an aligned and mutually reinforcing manner. These strategic pillars are:

- 1. Policy and Regulation
- 2. Human Resource Development
- 3. ICT Infrastructure
- 4. Content and Community
- 5. Innovation Clusters (IC)

While interventions in all five strategic pillars are desirable for a holistic and effective national ICT strategy, not many IDB member countries have the resources and capacity to do so. And this Guideline certainly does not suggest that member countries invest in and across all the strategic pillars at any one time in order to be effective. In particular, all of the LDMCs and many of the developing IDB member countries need to continue to address the primary and secondary priorities to ensure that certain pre-conditions are met. While it is not necessary for all pre-conditions to be met before a country embarks on a national ICT development program, a certain level of investment and resources must be channelled to address the priorities (literacy, basic infrastructure, political stability, etc.) and challenges as highlighted in Section 3.



Figure 5.2: Strategic Pillars for National IT Strategy

Once an IDB member country has set realistic vision and objectives within the context of the shared values outlined earlier, it can then plan for and implement interventions in any of the five strategic pillars, progressing from a basic level to intermediate and subsequently to a more advanced level (see Figure 5.2 above).

Interventions should be phased and sequenced properly, depending on the resources, capabilities and national priorities of the country. The key is to design interventions such that policy and projects in any strategic pillar will mutually reinforce or complement interventions in other pillars. The spill-over effect and synergy spawned from the inter-pillar initiatives will help accelerate the achievement of the objectives of the intervention. This is achievable via this recommended Guideline of shared vision, goals and values. This translates to the pooling of resources and initiatives in a mutually reinforcing manner to realise the common strategic ICT goals of the country¹.

The following sections will describe the five strategic pillars and their importance to the national ICT strategy, and offer some generic recommendations for IDB member countries.

5.3.1 Policy and Regulations

The first strategic pillar in which interventions, if properly designed and implemented, will have major impacts on national ICT development is the policy and regulatory domain. IDB member countries should establish the right set of policies, legislative and regulatory frameworks that promote the uptake and diffusion of ICT. Policies and regulations should be designed to encourage and stimulate growth of ICT by building capacity in all dimensions: supply, demand, and governance.

The recommended first step is to establish the policy that ICT development i.e. investment, skills, usage, infrastructure, etc. is a national priority. One of the best ways to promote ICT use is to remove or reduce barriers to use. Any government policy that makes computers more expensive will discourage the use and reduce the possible benefits of ICT. Lowering tariffs and taxes, eliminating other trade barriers, and encouraging fair competition will help to make investment in IT less prohibitive. For the majority of IDB member countries, however, this type of policy intervention must be designed and implemented very carefully, considering that they do not have adequate institutional capacity to deal with rapid change and competition.

In order for the policies and regulations to be effective it must take into consideration four national policies: technology, industrial, telecommunication and media (see figure 5.3).



Figure 5.3: ICT Policies take into account the different policies

¹ This concept is referred to as the Development Dynamic in the UNDP report: "Creating a development dynamic: Final Report of the Digital Opportunity Initiative", July 2001.

- One. Technology policy needs to be set to provide a climate conducive and receptive to technological innovations. This can be accomplished through policies and regulations that encourage innovation, creativity and intellectual protection within the spheres of Education, Science and Technology and Commerce.
- Two. Industrial policy aims to provide opportunities for growth by stimulating the development of new industries.
- Three. Telecommunication policy seeks to secure the provision of communication services and cost-effective infrastructure.
- Four. Media policy aims to provide the framework for the development of the broadcasting and information services.

With the convergence of Information Technology, Telecommunications and Broadcasting industries – hence the term ICT – the above separate policy domains must be formulated and implemented in a cohesive manner so as not to cancel each others' objectives.

Privatisation, liberalization and deregulation are some of the policies that are being pursued in many national ICT strategy frameworks. There is evidence to indicate that deregulation has had a positive influence on the development of infrastructure in almost all developing countries. For example, the benefits of competitive privatisation come not only in the form of improved infrastructure, but also through increased foreign investment. Liberalization and creation of a competitive environment in ISP market, in many instances, resulted in rapid market expansion. On the contrary, regulatory actions that restricted competition significantly inhibited the growth of Internet services.

The establishment of a favourable business environment can increase foreign direct investment and trade. Although historically many developing countries appeared to benefit from reverse engineering and lax enforcement of intellectual property rights, in the long run the development of knowledgeintensive industries is unlikely to take place without appropriate property and commercial laws. These legal and regulatory environments should incorporate generally accepted principles of fairness, speed and dependability of execution, effective enforcement, and compliance with international norms regarding Intellectual Property Rights (IPR) protection. Policymakers need to ensure that the tax regime is nondistorting and does not act as a disincentive to investment and entrepreneurial efforts.

The domestic legal and regulatory frameworks need to be supportive and adaptable in developing ICT because they can significantly impact the number and type of obstacles faced in both the domestic and international markets. This is particularly important for IT because it is a non-traditional industry and existing legal codes are either not applicable or new legal questions are still being posed e.g. in the area of electronic commerce.

In addition to the policy domains above, there must also be key policies in other related strategic domains such as in human resource development, education, science and technology, enterprise development, as well as policies to support the social transition from the predominantly agriculture or resources based industries to the more knowledge and skill-intensive industries. For example, displaced workers need to be re-trained to secure employment in enterprises that require more skilled workforce. Social safety nets may need to be put in place for those industries that are in decline. Even though this study generally recommends liberalization and privatisation policies to develop ICT, these must be

carefully formulated by taking into consideration the costs and negative impact on displaced workers, immigration, urban migration, and the social fabric.

With regard to IPR, for instance, IDB member countries would be better off formulating a strong policy to protect the rights of the intellectual property that are indigenous and those for public good and communities, instead of focusing on protecting private IP. Many IDB member countries possess abundant natural resources, bio-diversity in plants and species, and long-held knowledge in traditional medicine. These properties should first be classified and managed by the people or public institutions of those countries themselves before global corporations or private research institutions turn them into means for private profits.

All the policy development exercises should be done in a manner that promotes participation among and transparency within industries and government sectors. This is useful for both the development of ICT and its impact on other areas. For example, the Internet can be used to ensure transparent access to legislation, taxation codes and government services, and thereby facilitate consumer and citizen input into governance and processes for a particular public and/or private sector.

Lastly, an appropriate mix of short-term and long-term policies is needed to create a national environment in which payoffs from IT investments can be achieved. Whatever the approach and focus, policymakers and institutions responsible for coordination and implementation must realize that the final benefit to the economy will only be significant when the level of investment and diffusion in ICT has reached a certain critical mass.

5.3.2 Human Resource Development

Obviously, basic literacy is of crucial importance for the development of any economy. Even though it is not an absolute requirement that a country has high literacy rate, successful development of IT as a sector and IT as an enabler are both dependent upon the quantity and calibre of professionals that a nation can develop.

In this regard, IDB member countries should step up effort to encourage the citizens to acquire knowledge, as called for by Islam. The first step for many IDB member countries is most likely in the area of educational reform, particularly if there has been institutional separation of modern education from the traditional or religious education. The formal institutions of education that exist today, and even many of those in the planning stages in developing countries, are becoming less relevant to other requirements of emerging 'knowledge societies'. It is important for these countries to reshape education institutions in a way that is consistent with their development priorities. There must be policies and programs to reconcile the scientific and rational worldview with Islam's quest for knowledge and spiritual enlightenment. Modernization must not be confused with Westernization.

There must be investment in producing qualified teachers, administrators and relevant curriculum, starting with primary schools. Teachers and students must be encouraged respectively to teach and learn science and mathematics. At higher level of learning institutions, there should be more focus on teaching science, engineering, medicine, computing, telecommunications, and technology management subjects.

Countries should focus on continuously educating and training a sizeable group of scientists, technologists and IT professionals so that they form the initial critical mass of knowledge workers. IDB

member countries must provide incentives for these scientists and technologists to form communities to undertake research and development in their areas of interest.

Specifically for ICT, strategies and programs must be carried out to produce sufficient professionals with the management and technical capabilities to provide and maintain ICT infrastructure and related ICT services, and to adopt new technologies for local requirements. Both tertiary education and corporate training are important components of ICT skill development. Progress in these areas requires an increase in the number of tertiary institutions, promotion of relevant educational curricula, and creation of new educational facilities with specific emphasis on ICT skill development. Skill development and retraining of the existing workforce is the key. Policies encouraging businesses to allocate resources to employee development and training can be an important mechanism for achieving this outcome.

Also important for achieving development goals and sustainable growth are the institutions to link the technology to those who would benefit from its use. A number of different sectors, including the national and global private sector, as well as community networks (particularly for the development of ICT intermediaries and users) have been involved in skill development and the creation of ICT awareness. However, it is not just the creation of skills that is important, but also the creation of jobs to reduce "brain drain." This process may be reversed if proper measures are taken by policymakers to improve market and social conditions through the mutually reinforcing intervention in the strategic pillars.

5.3.3 ICT Infrastructure

This third strategic pillar calls for IDB member countries to make informed investment on developing network infrastructure capacity to enable key sectors to take advantage of newer, cost-effective telecommunications and computer technologies. Until recently, the financial situation of a country's public telecommunications company was defined as country's ability to build and maintain core network infrastructure, as well as to provide universal access. However, with privatisation, liberalization and policies aimed at increasing competition in this strategic sector, there is now a greater involvement of the private sector in the provision of ICT infrastructure.

Ubiquity and the move toward universal access are becoming increasingly feasible due to rapidly declining costs for networking and telecommunication technologies. These declining costs allow developing countries to leapfrog through the use of more recent ICT technologies, which could not be easily or quickly done by the more developed countries due to the huge investments made with older technologies. The involvement of the private sector has hastened the adoption of these technologies in many developing countries, particularly in the case of wireless and mobile. While private telecommunications companies are hesitant to provide infrastructure to rural and low-density areas, governments of IDB member countries can introduce regulations or interventions for these companies to contribute to universal access funds to help governments pay for community networks and public access points.

As this Guideline suggests, ICT infrastructure deployment must be placed as a national development priority. Infrastructure is to be rolled out as part of an overall program that includes simultaneous actions in other strategic pillars of this Guideline. This could include the introduction of a supportive policy and regulatory framework, partnerships with NGOs, private sector and non-profit **60**

community initiatives to expand ICT access and services, support for Small Medium Enterprises (SMEs), and strengthening demand. Such public initiatives include the provision of network and computers in schools and communities, promotion of their usage, electronic government programs, and the enhancements of existing electrical and telecommunications infrastructure. Such initiatives can also help to enhance the financial sustainability of the infrastructure created.

Aligning human capacity skills development with ICT infrastructure development initiatives would create the desired mutually reinforcing dynamic that would help achieve the overall vision and objectives of the ICT strategy. An overall strategy that focuses on strengthening human capacity will result in much more effective spending on infrastructure because insufficient skills will not create a bottleneck to its effective deployment and use.

Lastly, in order to take advantage of the phenomenal growth in content, applications, and knowledge available from around the globe, ICT infrastructure should also include sufficient bandwidth for international connectivity.

5.3.4 Content and Community

Development of ICT involves more than infrastructure, policies and human resources programmes; it also requires the critical mass of users to utilise the available infrastructure. To achieve this critical mass, there must be applications and contents specifically developed to meet the needs of many communities of the country i.e. government, business, health, rural, local council/government, education, etc.

The right content and community programs will serve as a catalyst in the development of ICT in a country by taking full advantage of social and economic benefits associated with extremely rapid innovation in advanced ICT-based goods and services. The catalytic effects by these programs are often useful for economic spin-offs and the attainment of stakeholders' buy-in, thus creating a momentum for the country to proceed with future ICT plans and implementation.

Carefully crafted programs provide the platform to bond policies, skilled human resources and infrastructure developments of the overall IT strategy. ICT capabilities to achieve development goals will not be effectively leveraged without contents responsive to user needs and local conditions, in a language commonly understood, and with technical specifications that are sensitive to the actual use and working environment of users. Partnerships between community, local government and the private sector are key in this area, as are consultation mechanisms that facilitate bottom-up approaches and inclusiveness. Therefore, these programs should be designed in such a way so as to promote the participation of local businesses, communities and entrepreneurs to develop local expertise and technologies. This is the recommended approach to build capacities and capabilities, and will help to balance the dependence on foreign technologies and content. This is also an effective way of bridging the digital divide between the urban and rural communities.

LDMCs should initiate various several content and community programmes/applications that do not require huge investment and structural reform. This way, countries will be able to start at the smallest community level where content and ICT applications can provide significant and visible impact. Some of the focus areas are health, governance, education and community development. There are already some advanced ICT applications in the development phase in several developing countries' IT programmes. The following sections will highlight some of the potential content and applications that are relevant to many IDB member countries.

5.3.4.1 Government

Governments play a central role in the creation of new 'knowledge societies'. They provide a range of services to citizens and industry, and engage in functions as diverse as economic development, environmental monitoring, and provision of public information. More importantly, government budget in developing countries usually constitute a major portion of the country's spending. Hence government's investment in technology sets a model for the rest of the country and also influences the type of use, demand and supply equation of the economy. The government can be the catalyst by becoming sophisticated users themselves. An initiative such as e-government can attract the skilled resources to develop and deploy applications, and government can amplify their impacts by working with the private sector. The implementation of Electronic Procurement by the government of several IDB member countries has resulted in getting local contractors and small businesses to be online in order to conduct business with the government. This system helps reduce processing time and costs, while at the same time increase transparency.

ICTs have considerable potential to cut administrative cost through the reorganisation of internal administration and through alternative provision of services. Electronic delivery points of access that can be made available from homes, schools and libraries include audio text, voice and data information services, teletext and interactive television services, fax and state-provided terminals. Multimedia customer-activated kiosk combines text, sound, video and graphics. These multimedia and multilingual service delivery tools can be located in public places and provide information to meet the particular needs of citizens. The use of smart cards as a form of personal identification and authentication, as well as additional functionalities such as electronic fund transfer and state benefits can be provided through these kiosks. Remote areas can be served by cellular telephones, satellite receivers and laptop computers and the range of benefits potentially available to citizens include social security, pensions and public assistance.

The availability of public information can be of major assistance to small and SMEs in administrative procedures for export, import, tax filings, business registration, and licensing. The benefits of these delivery mechanisms include user-friendly interfaces and advice for administrative procedures such as completing electronic forms; efficiency gains in claims processing time; and reduced cost of operation compared to paper-based systems. These services can be used in the prevention of fraud and abuse provided that adequate security measures are built into the system. Government wide directories of government services and contact details facilitate citizens' access to the right organisation.

5.3.4.2 Urban and Rural Development

ICT applications are supporting development programs in many urban and rural areas in developing countries. Databases and drawing facilities, simulation and modelling tools, are integral supporting decision tools on which the planning, management and development process can be based. Diverse current and historical data on health, education, water supplies, sanitation, and population growth and movement can be captured, collated, manipulated and presented. Moreover, the visualisation of real world situations assists in the analysis and identification of options such as land use plans for rural areas and infrastructure and utility plans for urban areas.

The successful implementation of these monitoring tools requires considerable time and resource investment in the infrastructure, applications for data capture and analysis, and in sound training. Besides using IT for planning, modelling and urban and rural development, combining these systems with other government applications like citizen identification and income tax can help to minimise fraud and ensure a more equitable distribution of development spending.

5.3.4.3 Health

Within these Guidelines, IDB member countries should pool their resources and leverage initiatives made in the applications of ICT in healthcare. The application of ICT to provide medical care on demand and independent of person-to-person contact is referred to as Tele-medicine. These applications are supporting the more efficient exchange of information between health professionals thus saving time and money. They enable the transfer of patient records between sites and help to improve the response time for treatment. ICT applications can improve clinical effectiveness, continuity and quality of care by healthcare professionals.

Tele-medicine can provide medical care to people in their homes, in isolated places and in times of emergency, and permits remote consultations between health professionals. Physician distribution and access issues for medically undeserved and geographically remote areas of the developing world may be overcome by this method of extending the reach of specialists and general physicians.

On a smaller scale, a personal computer, a single telephone line with internet facility can be used to help provide healthcare services to cater to a whole remote community. The information communicated can be useful in helping governments prioritise and disseminate medical supply or deploy healthcare resources to the community with the most pressing need.

5.3.4.4 Education

Besides ICT applications in health, the application and contents in education may prove to be the most promising area for IDB member countries. The use of ICT for educational purposes represents a significant opportunity for IDB member countries to address the perennial problems of illiteracy as well as low computer awareness. Computers and education content should be used aggressively to reach out to students in poor rural areas to supplement the lack of teachers, textbooks and classrooms in many IDB member countries.

The use of ICT in education has shifted traditional education approaches to models that focus on student's learning rather than on teaching. This emphasis on the learner means that education content can be used to devise a 'personal learning action plan', to tailor knowledge and training to the pace and style of the learner. With this, the learning path, instructions, and feedback can all be geared to the individual student's knowledge, skills, and error patterns. Multimedia applications enable learning at home, at school, and in the workplace.

High-speed communication networks enable teachers to work and develop courses together. Video-conferencing and computer conferencing are already providing some learners in rural and remote regions of developing countries with access to teachers in other locations (mainly in the industrialised world). Adult education, employee improvement and industrial training can also benefit from interactive digital video and CD-ROMs. On-line training using the Internet to deliver courses has the advantage of

allowing full flexibility regarding the time of study although improvements still need to be made to access during peak time.

Despite the declining cost of ICT, the total cost of introducing major changes in education and training that takes place in schools, work places and homes continue to be very high. Due to the new educational approaches and models enabled by IT, education must also now include a focus to develop the right thinking, communicating and interpersonal skills. A critical starting point in the application of ICT in education is the provision of new IT skills and teaching approaches for the teachers, educators, and school administrators.

On a smaller scale, much like the application of ICT in healthcare, the same telephone line, personal computer and the Internet service can provide educational material for a whole community cheaply and quickly. Hence the Guideline emphasizes the complementarities among initiatives in ICT infrastructure, healthcare services and education towards a common goal of realising the ICT vision and objective of each IDB member.

5.3.4.5 Agriculture

As many IDB member countries are still in agricultural-based economies, interventions to promote development and usage of ICT applications and contents for the community of farmers, regulators, wholesalers, distributors and even retailers would have the potential to provide sustainable socioeconomic benefits. Sustainable food systems benefit from the responsible use of resources by farmers who perform a wide variety of tasks in their crop management; pest and disease monitoring, identification, and remediation; and harvest management. These tasks can be facilitated by expert systems, which increasingly adopt an integrated problem solving approach to all aspects of crop management. These applications are improving with more user-friendly interfaces to ensure easy capture of local knowledge and faster information dissemination.

IDB member countries should collaborate to formulate regional development programs to use ICT applications and content to impart knowledge, best practice and information from national and international agriculture research centres for communities whose livelihoods depend on agriculture. The long-term goal is to use ICT to provide access to regional resources for technicians, researchers, farmers, distributors and consumers.

5.3.5 Innovation Clusters (IC)

The fifth strategic pillar in this recommended Guideline for a National IT Strategy calls for IDB member countries to establish Innovation Clusters (IC) related to ICT in their domestic and also regional markets. Innovation Clusters are the linkages, interactions, relationships and development of different but inter-dependent entities i.e. education, research and development, industries, financial institutions and supporting services to form a virtuous cycle of innovation and entrepreneurship. Innovation Cluster forms a value chain that supports and reinforces each participant of the system in developing new innovation and technology². There are many examples of national/regional innovation systems at work and Silicon Valley is one classic example. Figure 5.4 portrays the relationship and roles that different institutions and companies in Oulu, Finland played in developing the telecommunication industry that eventually spawned

² Porter, Michael, *The Competitive Advantage of Nations*, Free Press (June 1998) - see Bibliography

world-class, global companies such as Nokia and Sonera. The interaction that existed between these entities ensured the success of the whole system.



Figure 5.4: Oulu Finland Innovation Cluster

While the earlier ICT hubs or innovation clusters i.e. Silicon Valley and Boston Route 128, were initiated by the natural gathering of entrepreneurs, industry leaders and researchers, many recent cluster developments have been the result of governments' planned effort. Several developing countries have attempted to emulate this model by creating the infrastructure and providing incentives to accelerate the establishment of such clusters.

India, for example, has established these hubs or clusters in Hyderabad and Bangalore. This clustering strategy has made a positive impact on the IT industry, particularly in software development, and related supporting industries in these cities. Measured by indicators such as the creation of (higher paying) jobs and new companies, the growth in these cities for the period of 1992 to 2000 has far outpaced the average for the whole of India. The same impact has been observed in similar hubs or clusters in other parts of the world (see figure 5.5).



Figure 5.5: Growth in employment and companies in the hubs.³

Countries that want to build a dynamic and resilient ICT production sector should incorporate this pillar of the Guideline. This is a long-term program that will build a new generation of researchers, innovators and entrepreneurs for future applications. Dubai Internet City and Multimedia Super Corridor are excellent examples of the purposeful effort by the government and other institutions in education and industry to establish clusters of world-class innovators and entrepreneurs creating the new engine of economic growth.

Starting initially with a regional/special zone as a hub, governments wishing to accelerate the process should establish other similar hubs/clusters link and manage them to eventually form a nationwide network of innovation system. This system, with the support of other strategic pillars of the strategic framework, will give rise to many 'degrees of freedom' and opportunities to shape the direction of the ICT development. To accelerate the development of this technology cluster or innovation system, there must be incentives and programs to promote R&D, build capabilities and capacities for ICT Small Medium Enterprises (SMEs), and to provide venture funding. For example, incubators to nurture new ideas and invention, SME development programmes, and research grants for universities in basic and applied sciences, are some of the incentives that can be provided as part of the development of IC.

Realistically though, very few IDB member countries can afford to sustain the investment for large-scale, national level Innovation Clusters on their own. To help the majority of the IDB member

³ Dun & Bradstreet New Business Starts, US Bureau of Economic Analysis, US Bureau of Labor Statistics, Eurostat, Statistic Finland, Software Technology Parks in India

countries, this Guideline suggests that Innovation Clustering (model in Figure 5.4) be deployed across and among IDB member countries. Using Internet and the necessary ICT applications and infrastructure such as IDB's OICNetworks⁴, regional IC can be established among IDB countries that share common boundaries or are in close proximity with each other, share a common heritage and culture, and have similar levels of ICT developments. Hence regional IC can be established for the following groups:

- a. Gulf countries: Saudi Arabia, Kuwait, Bahrain, Qatar, UAE and Oman
- b. Levant: Lebanon, Syria, Jordan and Egypt
- c. North and North East Africa: Sudan, Egypt, Libya
- d. Maghreb states: Tunisia, Algeria, Morocco
- e. ASEAN members: Malaysia, Indonesia, Brunei
- f. Pakistan, Iran, and possibly Bangladesh

These regional IC can start with a focus on ICT education, research and development, sharing best practices and knowledge to help one another. This knowledge sharing forums will in turn help to elevate the knowledge level on other areas without additional expensive costs. These activities could then extend beyond research and academics. This suggests that within a regional IC or hub, each IDB member country could focus on a specific function. For example, one country may focus on research and software development, one on professional services, another on building world-class companies by providing training and/or funding, etc. The focus could also be done by regional IC i.e. one region could focus on ICT applications for petroleum/natural resources, while another on multimedia content for education and entertainment.

In summary, this study recommends that the elements include the development of domestic and regional IC in and among IDB member countries because:

- a. A combined effort can maximise returns on the investment costs associated with the ICT hub i.e. several countries share the same cross border infrastructure. Hence the overall costs of building the needed ICT infrastructure for each country is lowered;
- b. The combined effort among countries affords higher capacity networks to support state of the art software based applications;
- c. This approach enables cost-effective sharing and coordination of resources, knowledge, best practice, and infrastructure, which would otherwise be beyond the reach of many individual IDB member countries implementing this strategy on their own;
- d. Case studies of cluster development in member and non-member countries are evidence that clusters can help drive economic growth through the creation of jobs and new ventures, and in the long-term, foster innovation and competitiveness.

⁴ OICnetworks is a joint venture company between IDB and MIMOS of Malaysia that started operations in August 2000. The main objective of OICnetworks is to help patch the digital divide in OIC member countries through the introduction of innovative and affordable ICT solutions

5.4 Critical Success Factors

The assessment of several IDB member countries' IT strategies and programs point to several factors that must be in place when developing, and most importantly, implementing the ICT strategy. These factors are strong leadership and political will, participative change, and governance and management.

5.4.1 Strong leadership and Political Will

Obviously, strong and visible leadership by the country's leaders are crucial to push for national IT development programs, which are complex and long-term, often requiring large investment and collective effort, but without immediate tangible results. When the head of state is championing the cause for IT development, this will help secure a high level of commitment from many government bodies, garner support from private sector and user communities, and inspire confidence from both local and foreign investors.

Another reason for the need to have the government in IDB member countries play the leading and central role in ICT development is the fact that the market, infrastructure and institutional capacity are underdeveloped. Also, in many member countries, the government is the biggest spender and user of IT, and will remain so for several years to come.

The leadership roles must not only be carried out by the top government leaders of the country, but also be exercised at the working and implementation level. While ministries and agencies such as economic planning unit and development board are responsible for setting policies and goals, there must also be leadership at agencies and institutions that are responsible for implementation, monitoring and ultimately delivering the services. Leadership by example and learning by doing should be encouraged at all levels to ensure successful transition from strategy to desired outcomes.

Leadership does not rest on government alone. More and more, leadership is required from captains of industries and community leaders. For countries with huge population and low ICT uptake, there is a need for a framework that allows for ideas and projects to be channelled from the grassroots i.e. content and community programs initiated by community leaders, NGO's, local government and students. The successes of national ICT programs in Jordan and Malaysia owe a lot to the leadership and will of not only their respective heads of states, but also their ministries, agencies and private ICT industry.

5.4.2 *Participative Change*

The implementation of a national IT strategy, by its very nature, is a long-term and complex undertaking. If one of the main objectives of this Guideline is to provide greater awareness on the importance of IT for development, then another critical success factor is the planned and effective management of change that is based on participative and inclusive approach.

Change management, by convention, is the methodology and process to facilitate change so as to adapt to the new set of environment. The environment can be the organization itself and the way things work, or it could be a community, or the whole nation. Effective change management is primarily a planned and collective effort to implement change in a manner that takes into consideration the needs of most of the impacted stakeholders and then to put in place the actions required to address them. Human

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beings by nature have insecurities and anxieties when confronted with changes, and if these are not addressed, people will, in the extreme cases, resist the change effort, either openly or silently. Therefore, a systematic and participative approach to manage the expectation and the manner the change is implemented is of paramount importance to obtain acceptance and buy-in, and ultimately, a successful change effort.

Participative change approach is also required because this approach provides the opportunities for the impacted stakeholders to shape the direction, pace, and scope of the development for many years to come. If in the past, the developments of large technical systems or infrastructures have involved only a small group of stakeholders from certain branches of the state executive, industry leaders, and science and technology communities, today these technology selection decisions must include other stakeholders in the light of their far-reaching consequences. These decisions cannot be left entirely to market forces either. Today's growing consciousness of the need for sustainable development, accountability and transparency calls for the inclusion of the user community and civil society (see Figure 5.6).



Figure 5.6: ICT development involving all impacted stakeholders

This participative approach is particularly relevant for many IDB member countries, where large segments of society are not aware of the benefits of ICT programs, and hence do not see the need for such programs. Therefore, national ICT programs for these countries, from strategic development through to implementation and monitoring, should be designed also as the participative process for interactive planning and learning by doing.

At the most fundamental level, a participative change management program must include open, continuous, multi-lateral communication between as many impacted stakeholders as possible, and as frequent as possible. These programs can be in the form of focus group discussions, road shows, seminars, and media briefings. These programs will not only create the awareness and build momentum but also demonstrate the transparency that is much appreciated by the stakeholders. Conferences and future

oriented workshops are also helpful in creating an environment for interactive learning and knowledge sharing involving actors from the host country as well as international participants.

5.4.3 Governance and Management

A good strategy is only as good as its implementation. While the leadership provides vision and channels the country's resources towards its strategic objectives, often it is during the implementation that programs fail. Hence, the establishment of the right governance and management models and structures is another critical success factor. It is in the organisation of people and institutions to manage programmes, and the right set of monitoring and control mechanisms.

In order for ICT development to have synergy among the strategic pillars, a sufficient level of institutional capacity is required. For example, the benefits of a good regulatory framework can be undercut if regulators lack the training, resources, or motivation to implement it. Even though policy formulation is typically the responsibility of national governments, other stakeholders' assistance through the sharing of good practices and expertise would be required to facilitate the development of institutional capacity and related competencies. Consequently, a critical success factor is the need to establish and rearrange government agencies and institutions to carry out the following functions:

- Plan Implement Control. These organisations, typically government agencies and ministries, play the traditional role of the buyer and user of ICT. They are responsible for conceiving, justifying, selecting and implementing ICT projects relevant to their organisations. In implementing ICT initiatives, such as the electronic government, the organisation will need to ensure that implementation meets the objectives of the organisation as well as that of the national program. Organisational transformation should also be carried out in order to achieve significant improvement in efficiency and effectiveness enabled by ICT.
- **Promote.** Several organisations including those that are responsible for implementation should collectively promote the national/regional/local effort. This would involve the design, coordination and implementation of public awareness and marketing communications programs required for the initiative. These programs form the initial part of the *participative change* process highlighted earlier in order to raise the public awareness.
- **Regulate.** A new ICT commission is recommended to regulate the practice of the industry to ensure among others, fair competition, quality of service to consumers, and compliance to international law e.g. with regards to environment and safety. Formulating and enforcing of regulations, addressing consumer complaints, and monitoring Quality of Service (QoS) will be among the main responsibilities of this regulator.
- Advocate. Besides promoting IT there should also be several organisations working with the top leadership, especially top government officers, industry representatives, and project champions, to push for appropriate policy reform and development programs e.g. intellectual property and cyberlaws. This can include computer industry associations, consumer activists, legal firms, and development and implementation agencies working together to shape appropriate policy and legal frameworks.

• **Develop and Facilitate.** There is a need for an organisation that is responsible to develop the ICT sector just as there are organisations responsible for developing other sectors of the economy. These organizations will focus on helping to develop capable ICT companies by running and coordinating programs to increase business and technical skills, to fund start-ups, incubate new development efforts, market products overseas, and match buyers and sellers.

A single, dedicated organisation will undertake the role of the regulator (from the above list of roles/functions) and it is recommended that another dedicated agency be responsible to nurture, develop and facilitate the ICT environment and industry. The latter agency will also be responsible to determine the business and funding model for each project within the IT strategy. This new, dedicated agency or ministry should have cross-sectoral responsibility to coordinate and manage the various initiatives so that they mutually-reinforce each other towards achieving the national goals.

As some of the successful country strategies indicate, the development of a new industry such as ICT is best managed by a new organization that is not encumbered by old policies and mindset. Egypt's Information and Decision Support Center (IDSC) and Malaysia's Multimedia Development Corporation (MDC) have been instrumental in the successful management and implementation of their respective ICT strategies. Among non-member countries, Singapore's InfoComm Development Authority and Ireland's Investment Development Authority (IDA) are testimony of the need to have a new dedicated agency to promote investment and development in ICT.

Given the number of IDB member countries that are unable to pursue continuous ICT development due to lack of funds and highly skilled workforce, a central, dedicated organisation is recommended that can help to consolidate and manage the scarce resources in order to achieve the highest impact and result. Other prevailing concerns in the development of member countries will put a burden on existing organisations and institutions if they are mandated also to develop national ICT programs.

This new organisational arrangement will enable the development plan to be initiated with the right skills, be they IT experts, scientists and economists, from either the public or private sectors. This flexibility is required to meet the complex and demanding needs of many stakeholders, in an industry that is still growing, changing, and innovating rapidly. Strategic management, marketing, technology industry development, and project management skills, on top of the different expertise from several disciplines, will be among the most sought after skills for such an organisation.

5.5 Centres of Excellence

In the context of these Guidelines, several centres of excellence (COE's) are suggested by virtue of their visibility and success in the development of one or several strategic pillars or their ensuring the presence of the critical success factors (CSFs) for the IT strategy. ICT development agency, IT planning council, investment authority, R&D centres and industry regulator are organizations that can potentially serve as centres of excellence in ICT strategy and development. The areas that these centres excel in can range from their capabilities in managing national IT projects, attracting foreign investment, through to developing the skills of IT entrepreneurs to meet the demand of their national economy. These centres of excellence can provide the knowledge, expertise, and best practices to be disseminated and shared with all IDB member countries.

Some of the suggested centres of excellence and the brief description of the areas in which they excel are listed in the table below. Further details on the activities and mission of these organisations are provided in Appendix B.

Organisation	Country	Focus of Excellence
GRAMEEN PHONE, Grameen Bank	Bangladesh	Infrastructure, content and community, Micro- finance franchising business model for rural people
IDSC – Information and Decision Support Centre	Egypt	Government information infrastructure, IT training
Information Technology Association of Jordan (Intaj)	Jordan	Smart Partnership between Government and Private Sector in formulating and implementing their REACH initiative, a national IT industry development plan
NIC – National Information Centre	Jordan	Network infrastructure, community development program, IT training, Information policy and standards
CMC - Communication and Multimedia Commission	Malaysia	Policy, Infrastructure development, Regulation; Cyberlaws; Managing convergence of IT, Communication and Broadcasting
MDC – Multimedia Development Corporation	Malaysia	Strategic planning, Content and Community, ICT Entrepreneur development; Innovation Clustering
NITC – National Information Technology Council	Malaysia	Policy advocate; ICT think tank, strategic planning; Content and Community
Ministry of Education & Ministry of Science and Technology	Pakistan	Human Resource Development; R&D policy
KACST - King Abdul Aziz City for Science & Technology	Saudi Arabia	Fostering Research and Development, R & D Policy
SESRTCIC – Statistical, Economic and Social Research and Training Centre for Islamic Countries	Turkey	Socio-economic research, fostering collaboration and cooperation,
DIC – Dubai Internet City	UAE	Infrastructure, Innovation Clustering

Table 5.1: Centres of Excellence

It must be highlighted that the above list of COEs is not exhaustive. As mentioned in the beginning of this section, these organisations are suggested simply based on the consultant's knowledge of their respective track record in developing or implementing one or several aspects of a national IT strategy
or related initiative. The definition of and the criteria to qualify as a COE for ICT should be the next logical step for IDB to consider.

Nevertheless, the suggested centres of excellence above can serve as the starting point for IDB to consider for superior coordination and better utilisation of resources. These organisations can potentially provide the best sources of standards and expertise in national ICT strategy development and implementation. They can provide training, education, and consultancy, or participate in joint-development of strategy and programs. Within the context of this Guideline, the COE's can and should be important participants in the proposed Innovation Clusters (see section 5.3.5). The experiences, lessons learnt and best practices from these COE's should be used to minimise the learning curve and cost of IDB member countries that want to establish and develop the domestic or regional IC.

6. SPECIFIC STRATEGY CONSIDERATIONS

While this study aims to recommend a Guideline for a National IT Strategy, it cannot yet provide actionable recommendations to address the specific ICT issues and gaps of each IDB member country. As highlighted in the beginning of the previous section, this recommended Guideline is at best a strategic framework for national IT plan. This section aims to provide some ideas and concepts that can be explored further when using these Guidelines.

6.1 Strategic Objectives: Learning and Productivity

The goal of all development efforts by a country must be to increase the quality of life of the citizens which means different thing to different people. To many people living in remote villages of the majority of IDB member countries, quality of life means having access to clean water, basic healthcare facilities and general education. On the other hand, to the communities in urban areas, quality of life could mean safer neighbourhoods and greater participation in the political process that will determine education and jobs for current and future generations.

Almost always, improving quality of life requires increasing individual and national incomes. And real income increase (after considering inflation and purchasing power parity) can only be achieved by increase in productivity – the efficacy with which a nation utilises its labour, capital, and natural resources. Productivity improves via greater use of knowledge, skills, technology and innovation.

With the above development perspective as the backdrop, the overall goal of national ICT strategy is to make information technology, knowledge, and innovation increasingly applied in all sectors of the country's socio-economic landscape. Hence, while productivity and income increase are the overarching goals of national development, the objectives of ICT strategy are the increase in knowledge, innovation and productive use of technology. These will be the Key Performance Indicators (KPIs) for the national ICT strategy.

6.2 Consideration for Intervention

As mentioned in the previous section, interventions in the strategic pillars need to be conceived so that, ideally, each intervention mutually reinforces interventions in other pillars. The following table lists some (non-exhaustive) ICT-related initiatives that IDB member countries can map against the Guidelines presented here to identify the initial set of initiatives that can potentially provide the needed impact in line with the national objectives. Naturally, any intervention that impacts more than one strategic pillar should merit serious consideration for its synergistic potential. From the initial list, a country should then carry out a detailed analysis for each initiative to determine whether it fits into the overall national strategy.

Example of initiatives	Governed by Strategic Directions set by each country						
	Policies and Regulation	ICT Infrastructure	Content and	Human Resource	Innovation Cluster		
ICT Trade Policy Initiatives	X		Community	Development	Cluster		
Telecommunication Regulation Initiatives	X						
E-government Initiatives		X	X	X	Х		
Business to Business Initiatives		Х	X	X	X		
Business to Customers Initiatives		Х	X	Х	X		
ICT Employment Opportunities Initiatives		Х	X	X	X		
ICT in the workplace Initiatives			X	X			
ICT in everyday life Initiatives			X	X			
Locally relevant content Initiatives		X	X				
Building Infostructure Initiatives			X	X			
Internet affordability Initiatives	X	X			X		
Internet availability Initiatives		X			X		
Internet Speed & Quality Initiatives		X	X				
Hardware and software Initiatives		X					
Service and support Initiatives		X	X	X			
School's access to ICT Initiatives		X	X	X	Х		
Enhancing education with ICT Initiatives		X	X	X	X		
Developing ICT workforce initiatives			X	X	X		
People & organizations online Initiatives		X	X	X	X		

Table 6.1: Matrix of sample ICT initiatives and their relevance to Strategic Pillars

To determine if a particular initiative fits with the national strategy, many factors will need to be analysed, such as capabilities to be developed or established; feasibility of the initiative; its impact in the short and long term; and its meeting the objectives of increasing innovation, learning and productivity. Last but not the least, the analysis should also help to determine the institution and/or government organisation that can be mandated to carry out the implementation. Once the initiative is 76

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handed over to the implementation agency, the role of the main government agency that leads the national IT strategy development and facilitates the selection of the strategic initiatives will be to manage and monitor the overall strategic program, using its cross-cutting power to resolve policy and inter-organisational issues.

6.3 ICT Strategies Based on Level of Readiness

Obviously, the ICT strategy for any particular member country must be formulated by taking into consideration the country's current capabilities and level of ICT-readiness. For the purpose of this study, an ICT Index composed of the following five components, was developed to establish the initial ranking among IDB member countries.

- a. Economic Index: composite of GDP per capita, export of goods and services as % of GDP, Electricity usage per capita, and GDP per capita annual growth rate (1990-2000)
- b. Education Index: composite of adult literacy rate, combined enrolment in primary, secondary and tertiary, % of tertiary students in science, mathematics & engineering
- c. ICT Diffusion: composite of number of ISPs, number of Internet hosts (per 1000 people), number of PCs (per 1000 people), and number of Internet users (per 1000 people)
- d. Telecommunication Index: composite of number of television, radio, telephone, and mobile sets
- e. Innovation Index: composite of number of scientists and engineers per one million people, patents per 1000 people, high technology exports as % of exports, R&D expenditure as % of GDP, number of scientists & engineers in R&D

(Note: Innovation index was not included in the overall ICT index due to lack of data for many member countries; see Appendix D for details).

ICT Ranking of IDB Member Countries								
1	United Arab Emirates	19	Pakistan	37	Benin			
2	Malaysia	20	Kazakhstan	38	Burkina Faso			
3	Turkey	21	Morocco	39	Gambia			
4	Lebanon	22	Jordan	40	Turkmenistan			
5	Bahrain	23	Gabon	41	Mali			
6	Saudi Arabia	24	Uganda	42	Chad			
7	Egypt	25	Sudan	43	Guinea Bissau			
8	Kuwait	26	Oman	44	Tajikistan			
9	Indonesia	27	Bangladesh	45	Comoros			
10	Brunei	28	Guinea	46	Djibouti			
11	Iran	29	Libya	47	Niger			
12	Maldives	30	Mozambique	48	Iraq			
13	Qatar	31	Yemen	49	Somalia			
14	Tunisia	32	Togo	50	Afghanistan			
15	Suriname	33	Mauritania	51	Palestine			
16	Algeria	34	Kyrgyzstan	52	Sierra Leone			
17	Syrian Arab Republic	35	Cameroon					
18	Albania	36	Senegal					

The table below ranks the member countries based on the overall ICT Index.

 Table 6.2 : ICT Ranking of IDB Member Countries

Although this study has refrained from any strict criteria to classify country readiness, for the purpose of discussion, it is useful to view IDB member countries as belonging to three categories of ICT-readiness:

- 1. Potential Leaders
- 2. Dynamic Adopters
- 3. Marginalized Countries

Obviously, countries belonging to a particular category will then require a different set of strategic focus and priorities in ICT development. Based on the proposed Guidelines and the ICT readiness ranking, a roadmap can be devised to help member countries determine their relative positioning, guide the integration of programs and initiatives relating to the strategic pillars, and chart the progress towards achieving strategic objectives. A visual roadmap is illustrated below.



Figure 6.1: Guidelines for a National IT Strategy Roadmap

Using the above simple roadmap, IDB member countries can have a common frame of reference to develop and monitor IT strategies. This is particularly relevant for collaboration, joint learning, and sharing of resources among IDB member countries, as recommended and emphasized in this study. For many member countries, especially the LDMCs or marginalized, the development priorities of building basic societal infrastructure and basic physical/commercial infrastructure remain essential. These, as has been highlighted in chapter 3, are the pre-conditions to be addressed before any notion of national IT strategy is seriously and comprehensively formulated.

These pre-conditions also imply that IDB member countries must have some level of stability and certainty in the macroeconomic, political, legal and social context. However, this entry level is insufficient to create the environment that will foster rapid learning, innovation, and the effective application of technology to increase productivity and ultimately the sustainable increase in income.

As the above roadmap and the strategic framework of this study suggest, the countries should first address the pre-conditions and entry level context. Then they should ensure the presence of the critical success factors for effective ICT strategy: political will and leadership, governance and management, and participative change, which is the starting point for developing national ICT strategy.

The next few subsections will highlight the specific focus and initiatives that member countries in the three ICT-readiness categories can consider

6.3.1 Marginalized Countries

As a general policy, many LDMCs would do better if they adopt alternative development models from other rural areas instead of blindly accepting mainstream development models. This is very important because many LDMC's depend on donor fund or funds from multilateral development banks (MDB), which may often lead to the tendency to follow the mainstream development models. Alternative approaches and models should be seriously considered when marginalized countries are trying to meet the pre-conditions, establishing political, legal and macroeconomic stability, or devising an ICT strategy.

Following are the specific recommendations presented along the strategic pillars of the Guidelines, for marginalized countries to consider:

1st. Policies and Regulations

For a start, marginalized countries may focus on creating broad awareness of the requirement for and benefits of literacy, knowledge, and IT-literate society. The government can set a clear policy that increasing literacy, knowledge, and use of IT, will be the national priorities. Along these policies, government can 'liberalise' the education sector, eliminate or reduce duties on books, education content, and ICT hardware and software. Clear, transparent and non-obstructionist policies and regulations will attract the business community including investors and banks support the nascent education and ICT sectors.

2nd. Human Resource Development

The most urgent need for many marginalized countries is to invest in the development of human resources, primarily through education. This will increase the literacy rate and subsequently the demand for information, news, and content. The subjects of science, mathematics, and one of the major languages i.e. Arabic, English, or French, should be the central part of the national curriculum at the primary and secondary levels. At tertiary level, there should be emphasis on similar subjects as

well as engineering and technology-related courses. Companies should be provided incentives to invest in employee education and training. Since governments have very limited funds, they should 'liberalise' the education market by allowing private colleges and professional training companies to provide services to develop human resources.

3rd. ICT Infrastructure

The government and multi-lateral development/donor organisations such as IDB, UNDP, World Bank, etc. shall continue to play the main role in funding the provision of ICT infrastructure for these countries, whether they are telecommunications lines, PCs for schools, or Internet access for communities. As such, the recommended initiatives are in those areas of policy, human resource development, and the improvement of the political and governance capacity. There must be some level of political stability, clarity and consistency in government policy, and capability in managing, monitoring and implementing projects that often involve large sums of money.

4th. Content and Community

In alignment with the above policies, regulations, and human resource development initiatives, programs to provide and/or develop contents and community applications should be geared towards basic education, reading and writing. Government should establish more public libraries and community centres where personal computers and access to the Internet is provided free of charge. Volunteers, part-time as well as retired teachers should be encouraged to provide education services to the community they live in, within the guidelines established by the government.

6.3.2 Dynamic Adopters

These countries appear to have inherent strengths in some of their socio-economic make-up but lack a coherent vision and strategy, and funds to realize their full potential. The objective for this group is to build the capacity, demand and skills in the country in order to promote sustainable development and diffuse ICT throughout their most strategic sectors.

1st. Policy and Regulations

As there is already a certain level of infrastructure and workforce education, countries in this category could focus on attracting investment from foreign and domestic sources to develop the IT supply-side capabilities. The policy should encourage as many companies as possible to distribute, sell, and integrate software and hardware to build tailored solutions for domestic market. If there is enough potential in the domestic and regional market, policy should be geared towards attracting investment in the assembly and distribution of PCs, peripherals and data communications equipment.

The telecommunications and ISPs sector should be gradually liberalised within a well-defined but flexible regulatory regime. The provision of infrastructure and services, especially in urban areas, should be privatised but government should ensure that the private operators contribute a certain portion of their revenue to a universal access fund that government can utilise to provide infrastructure and services to areas that are not commercially viable.

Government agencies and departments should lead by increasing the use of ICT to improve their services and processes. People with ICT-related education and training should be given the recognition and career path in government services. All these policies will help spur demand for ICT products and services and, coupled with policies to develop the supply-side, these will help generate multiplier effect to encourage citizens and private sector companies to use ICT.

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Policies in education, industry development, science and technology, and media should all be aligned with each other and the national objectives so as to increase the adoption and usage of ICT.

2nd. Human Resource Development

The national curriculum should include IT subject, in addition to the emphasis on science, mathematics and major language subjects, to be taught in primary and secondary schools. If a viable and sustainable business model is in place, government should introduce a national program to transform the whole education system to one that incorporates significant use of ICT in the teaching and learning environment (e.g. as in Malaysia's Smart School program; see Appendix A.1).

Other initiatives to develop human resources in ICT include:

- Incentives and programs for public and private sector organisations to invest in ICT training for employees. One example is the use of a universal Human Resource Development Fund (HRDF), to which organisations must make regular contribution but can tap into these funds to train employees. Malaysia's Human Resource Development Council (HRDC) ICT Grants for training¹ is another similar example. Incentives in the form of tax-deduction and/or rebates should be considered.
- Transfer of Technology (TOT) programs as part of major contracts awarded to ICT multinational corporations. These programs are to ensure that the necessary knowledge and skills are transferred to local organisation so as to be able to support and further enhance the implemented system.
- Collaboration between industry and the universities and colleges producing graduates in ICT in the form of practical training, internship scheme, or simply joint-development of a curriculum that focuses on the skills much needed by industry.

3rd. ICT Infrastructure

With the right policy and regulatory framework in place, the next critical factor for increased provision of ICT infrastructure would be the smart partnership between the government and private sector. This smart partnership is very important to determine the right funding or business model for sustainability and viability of initiatives to establish infrastructure. Within this context, IDB member countries in this 'dynamic adopter' category should consider the following initiatives:

- Campaign to encourage ownership of PCs e.g. interest free loan by government agencies or private sector organisations for their employees to purchase a PC.
- Provision of PCs and Internet access in schools e.g. for the computer lab, library and classrooms.
- Liberalisation of the establishment of Cyber-cafes in urban and suburban areas.
- Provision of PCs and Internet access in public libraries, community centres, youth clubs and other public places.

¹ Malaysia's HRDC ICT Grant provides funding to training institutions and citizens to be trained in ICT (see Ministry of Human Resources website at: http://www.jaring.my/ksm/index.html)

 Government national data network for use by as many government agencies and ministries as possible. This will provide economies of scale and optimisation of limited government resources.

4th. Content and Community

Since the government is usually the largest user and spender of ICT for countries in this category (i.e. ICT applications for the national power, telecommunications, banks and oil companies, customs, ports, etc.), implementing major ICT initiatives such as E-government or E-procurement will create impact in the form of increased usage, sophistication, and the capacity building of both the users and suppliers.

While the need for major ICT projects such as the above is obvious, it is highly recommended that many smaller initiatives at the local community level should be conceptualised, funded, and implemented. National IT strategy should include the mechanism and fund to allow ideas and projects to be proposed from several communities, and, if deemed viable, the projects should be carried out. The mechanism should encourage and facilitate the user community to work together with content providers and system developers to validate the ideas, propose projects, secure funding, and implement the strategy. The funding should be limited to pilot or small-scale projects. The program administrator will establish the criteria by which projects will be monitored, and more funding will be considered when the initial pilot is successful.

This approach will encounter many failures and projects that could not scale up to bigger initiatives, but the approach here is to mobilise a number of content and community initiatives and learn from both the successful and the failed initiatives. The following are a few initiatives that can be considered:

- Provision of low-cost training to public in usage of PC and Internet at community centres, mosques, local town halls and schools. Applications should be developed according the needs of a specific community.
- Community portal that provides communication, information (e.g. to get help on home repairs) and education.
- Application and contents targeted for farmers, fishermen, healthcare practitioners, housewives, and small local businesses.

5th. Innovation Clusters

The focus of "dynamic adopter" countries is to increase usage of ICT throughout the key sectors of the economy so as to increase productivity and efficiency. Nevertheless, countries in this category should start to develop and establish the foundations for innovative capacity in preparation to become potential producers of technology, not just users. Several initiatives for consideration are as follows:

- Establishing a special industrial/economic zone where ICT companies are located near universities and R&D centres. Incentives and infrastructure to "incubate" new ideas and projects should be made available in this special zone.
- State funded research in application of ICT in local context or for major sector of the country e.g. oil and gas, agriculture, textile, etc.

• Grants and prizes for innovation i.e. new business plans, ideas, applications, etc.

6.3.3 Potential Leaders

These countries have adequate level of readiness (infrastructure, skilled human resources, business environment, etc.) and many already have a national IT strategy. However, there is still a lot of room for improvement, particularly in ensuring that investment in ICT translates to positive impacts in the productivity, competitiveness, and the overall socio-economic conditions of the country. National strategy development and implementation takes place in a fast changing global economy. The challenge will be in effective execution of the strategy while keeping a flexible and adaptable position to changing dynamics in the regional and international situation.

1st. Policy and Regulations

Countries in this category are well on the way to fully liberalising their respective telecommunications sector. Competition and/or privatisation have also been introduced, to some extent, in the sectors traditionally controlled by government, such as power, utilities, education, healthcare, and transport. In a few of these countries, there are significant major industries e.g. oil & gas exploration, refining, processing; manufacturing and production of goods for export market; chemicals, textile, etc.

The main policy thrust will be to rapidly shift from a "consumer of technology" and production economy to one that is increasingly knowledge-based i.e. moving up to higher value-add production, distribution, and services. In this regard, the recommendations include:

- Continue with progressive deregulation and liberalisation of the markets for telecommunications, broadcasting, content, Internet Service Providers (ISPs), Voice and fax over IP, and higher education.
- In tandem with above, strengthen the legal and regulatory frameworks for consumer protection, IPR protection, dispute resolution, and fair competition. Monitoring quality of service, compliance, and establishing accreditation scheme for education, will be essential for progressive development.
- Policy and programs to increase basic and applied research, technology development, innovation, entrepreneurship, and professional management.

2nd. Human Resource Development

The national education curriculum should be reformed or enhanced to include not only science and technology subjects, but also subjects in creativity, innovation, and entrepreneurship, in order to produce future workers for the knowledge economy. Rote learning must be replaced with modern methods that encourage inquiry. This is necessary to imbue students, future scholars and workers with the scientific spirit that underpins research, generation of new knowledge, innovation and technological development.

Private institutions of higher learning, and all private sector companies, also need to include this shift in their respective education and training programs. The policy and practice of human resource management in organisations will need to keep pace with the modern management notion of harnessing and managing human capital. New organisational structures that are less control-driven but more values-driven will evolve to attract and retain the best knowledge workers.

3rd. ICT Infrastructure

Even though ICT infrastructure is available especially in urban areas, countries in this "potential leaders" category also need to focus on providing infrastructure and access to rural areas to minimise the disparity between geographical locations. As with the "dynamic adopter" countries, government can utilise innovative business or funding models to help fund the provision of infrastructure in rural or thinly populated areas e.g. universal access fund, or using business franchise model to implement ICT community centres nationwide.

Encouraging businesses to increase utilisation of ICT in their operations, the government or industry regulator must continue to benchmark network and Internet tariffs, reliability and bandwidth against the more developed countries. The provision of world-class ICT infrastructure at competitive tariffs is critical to attract Foreign Direct Investment (FDI) in higher value-adding operations such as design, processing, packaging, distribution, and marketing.

Regular market study should be done to help determine demand and sophistication of use. Industry dialogue, especially in policy matters, should also be carried out. All this will provide input to further improve infrastructure and access, and to encourage the private sector to lead in developing ICT infrastructure. The government will focus on its role as the facilitator and regulator in ensuring fair competition while protecting local values, culture and competitive advantage.

4th. Content and Community

The content development industry should be aggressively developed to meet the increasing needs in the domestic and regional markets. There is today a dearth of Internet applications and portals in Arabic language (for the Middle East and North Africa markets) or Malay language (for the 300 million people in Indonesia, Malaysia and Brunei). Providing contents to meet social, cultural and educational needs of IDB member countries in language such as Arabic or Malay represents an opportunity to bridge the digital divide due to language barrier. This initiative should be pursued through collaboration among a few IDB countries in the respective regional market so as to obtain economies of scale and prevent duplication of effort.

With higher level of ICT-readiness and sophistication of the business environment, the provision of applications and contents for the various (local) communities can and should be provided via innovative business/funding models such as the following:

- Matching grant (private sector and government put in equal investment)
- Build Own and Operate (BOO) or similar models
- Franchise model

The national IT strategy should allow for many small-scale content and community initiatives going on in parallel as opposed to having only a few big-bang national projects (such as Smart School or E-government). The focus, in line with the national strategic objectives, is to mobilise projects and funds, learn from doing, and encourage innovation and community participation.

5th. Innovation Clusters

For potential leaders, the development of appropriate ICT-intensive clusters in addition to special economic zone for ICT (such as the Multimedia Super Corridor in Malaysia and Dubai Internet

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City in United Arab Emirates), should be among the main initiatives of the national IT strategy. The clustering of companies and institutions related to a particular industry or sector has been found to be effective in increasing the productivity and competitiveness of the industry or sector because of the dynamic interplay between demand, factor inputs (labour, capital and natural resources), competition, and the supporting (supplier) industries².

Obviously the type of ICT-intensive clusters that should be established will depend on the strategic industries or sectors (i.e. their contribution to GDP and jobs) of a particular country. Some clusters that can be considered:

- Electronic and Electrical goods manufacturing sector
- Automotive manufacturing, assembly, distribution
- Oil, Gas and Chemical processing, refining, distribution
- Healthcare
- Tourism
- Retail, especially in Fast Moving Consumer Goods (FMCG) segment of the market
- Integrated transport and logistics operations involving ports, customs, freight forwarders, manufacturers, wholesalers. This may be viewed as cross-sector initiative because efficient and effective integrated logistics operations can serve many of the manufacturing, retail, and commodities/natural resource sectors.

Government of countries in this "potential leaders" category should carry out industry study to determine the ICT-adoption and productivity and then design appropriate policy, programs and incentives to cluster the most strategic sector(s) with the goal of increasing their productivity and competitiveness. If all other strategic pillars of the Guidelines are also adequately addressed, this clustering initiative to increase productivity and competitiveness will logically translate into increased utilisation of ICT and E-commerce

Lastly, besides considering domestic clusters such as the above, IDB member countries that are potential leaders should also consider establishing regional Innovation Clusters, as highlighted in section 5.3.5. In a similar fashion, the regional clusters need not be based on the ICT sector per se, but can be for those sectors that will utilise ICT intensively if the focus is on being competitive and productive for the regional market.

6.4 Role of IDB

Islamic Development Bank, as the initiator of this "Guidelines for a National IT Strategy" study, can and should play an important role in encouraging the development of ICT in member countries. In this way, IDB can serve as the first point of contact for any assistance related to ICT strategy. The role that IDB can play will be an extension to its traditional roles of providing trade and development financing. In this regard, IDB can consider the following programs and incentives to help member countries in developing and implementing their own IT Strategy:

² Porter, Michael, *The Competitive Advantage of Nations*, Free Press (June 1998) – see Bibliography

1. ICT Development Fund

IDB as a development bank can establish a fund for member countries to tap for ICT planning and development initiatives. By providing this fund, IDB can monitor, learn and establish better guidelines, criteria, and best practices that may be unique to member countries. Additionally, IDB can facilitate the sourcing of skills and expertise lacking in any particular country.

The fund can be used to finance different aspects of ICT development programs, such as:

- ICT market study and/or strategic planning
- ICT infrastructure financing
- Content and community project funding
- Modernisation or reform in the telecommunications and information services sectors
- Establishment of science and technology park, incubation centre, ICT-intensive clusters

2. ICT Entrepreneur and SME Development Program

Programs and incentives to encourage the research and development in new ICT applications as well as business start-ups. Programs should include incubation of new project/business ideas, training in ICT business management and in the unique skills required to market high-technology products.

3. Advocacy for Alternative Development Model

As a major development bank for Islamic countries, IDB should be one of the main channels for Islamic countries to advocate for alternative development model that is more aligned to Islamic principles of fairness and social justice. IDB can also lead in applying the Islamic concept of development, knowledge, economic system, and technological innovation in some of the development projects

4. Technology Venture Capital

Entrepreneurs usually require different types and sources of funds at different stages of development. IDB can provide venture capital to fund new start-up in its member countries that has technology as a critical component of its business plan. The fund can be injected depending on the requirement of the business i.e. for R&D, seed funding, marketing, pre-Initial Public Offer, or expansion capital.

5. HRD and ICT Education Program

A program and special fund/scholarship can be established to encourage students and professionals from member countries to pursue higher education in ICT-related subjects. This program can also assist member countries to modernise their national education curriculum to include and emphasise the subjects of mathematics, science, engineering, and possibly a major language such as English, French or Arabic. These subjects should form the core of the curriculum to shift to a knowledge-base society.

6. Grants for R&D/Content and Community Projects

Special grants should be provided to promote and encourage research and development for providing content and applications to local communities. This grant should be used at the pilot stage, and if projects are successful, IDB can help source other types of funding. Projects to meet the needs of the local community include community bulletin board, village online library, portal for cultural and historical content, or portal for online health and education resources.

7. Model IT User or Learning Organisation

As an organisation IDB can be a model user of IT and a model learning organisation – encouraging, applying and diffusing IT and knowledge in its business processes, and providing access to all levels of staff. Even though there are already IT system in place, IDB can be a model user in using ICT to further increase efficiency, productivity and knowledge sharing.

8. Leveraging on IDB's Initiatives such as OICNetworks

Within the context of these Guidelines, IDB should leverage on and promote the OICnetworks, the infrastructure that has been developed to facilitate trade and information exchange among member countries. OICNetworks is a joint venture company of IDB and MIMOS of Malaysia, established with the objective to help patch the digital divide in OIC member countries through the introduction of innovative and affordable ICT solutions.

OICNetworks has launched two programs:

- OICexchange an Internet platform to foster relationship through electronic communication and information exchange between several core communities of the member countries -- Government, Social, Education and Business communities.
- OICtrade an online and offline system offering critical information to support business
 decisions and the facilities for cross-country buying and selling. OIC trade also provides
 facilitation services such as trade financing, insurance, logistics and inspections so that the
 whole needs of buying and selling activities can be fulfilled.

As a major development bank for the majority of Islamic countries, IDB is in a unique position to help many member countries develop their ICT capacities and capabilities. If IDB can provide the assistance through some of the above suggested programs and incentives, it will be well on its way to be a Centre of

7. CONCLUSION : TOWARDS COLLECTIVE CONSCIOUSNESS AND ACTION

he development of this Guideline acknowledges that the knowledge-based economy enabled by ICT creates new opportunities for nations and communities. National IT strategies can no longer be pursued in isolation but must be positioned within the global context, while simultaneously addressing the needs and opportunities emerging from the local context, particularly the social, cultural, and spiritual conditioning of Muslims.

As this study has indicated, there are many interdependent causes for the increasing disparity in IT production, adoption and diffusion among IDB member countries. Besides the perennial problems of poverty and low human capital development in many IDB member countries, this study also suggests other possible root causes ranging from the differences in beliefs and understanding on the notion of development and knowledge, the values and worldview underpinning the beliefs and development model, and hence to the social and cultural attitudes toward technological innovation and growth.

Several successful ICT strategic initiatives among several member countries and non-member countries, as well as the Centres of Excellence (COE) as suggested in this study could serve as a reference model on the way forward.

The proposed Guideline for a National IT Strategy is essentially a strategic framework for learning and discovery, as any strategy to foster innovation and change should be. This is because while ICT offers opportunities and solutions for many IDB member countries towards improving socio-economic conditions, it is also a technology that can radically transform arrangement and structure of industries, markets, and institutions. It is closely linked to the need for transparency, for change, for greater access to information and knowledge, and ultimately to new sources of wealth and power. And this study has also indicated that there are other social and cultural barriers to the wider adoption of IT and its underlying concept of knowledge and development. ICT has been demonstrated to be an enabling tool to enrich the social and cultural well-being of people.

It is this threatening, uncertain and yet promising nature of ICT that make planning for and managing its development very challenging and difficult. This Guideline, therefore, is a model to foster the evaluation and generation of other strategies and alternative development models. It is a strategy to encourage the establishment of a favourable environment for new learning, innovation and entrepreneurship. It has to be flexible and adaptable because needs and solutions/applications of the target communities in many IDB member countries can never be fully determined until we act on initial ideas, strategies, and pilot projects.

To foster the climate for learning, innovation and change, principles of trust and respect must be observed. This is why the proposed model starts with the need to leverage on and abide by the shared values and principles of the Islamic faith. Without trust, there will not be enough exchange of information, ideas and knowledge. Without trust, markets cannot be really efficient in allocating and distributing information, knowledge, resources, and wealth. Without respect and care for community and cultural identity, impacted stakeholders will resist, ignore, or shy away from the very technology and strategies meant to improve their social, economic, and cultural well-being.

IDB member countries should participate in the growing global consciousness and debate, not only among developing countries but also industrialized economies, the current widening gap between the world's haves and haves-not. This associated digital divide is caused by the policies and institutions shaped out of value-neutral worldview of capitalism that places man's pursuit of self-interest at its centre. The leadership, private sector and civil societies of IDB member countries must work together to meet the challenges of the global competitive and predatory forces while continuing to address the development needs of their local, domestic economies. In short, the key stakeholders of IDB member countries must collectively provide an alternative vision required to bridge the divide. The global challenge of bridging the digital divide requires a global response from IDB member countries.

If this study and its proposed Guidelines are able to contribute to further discussion on possibilities and options, then it would be meeting its primary objectives: to promote greater awareness of the importance of and opportunities through IT, and ultimately contribute towards the collective consciousness and action of IDB member countries.

APPENDIX A : COUNTRY ANALYSIS



alaysia is a multi-ethnic nation with a predominantly Muslim population (60% of 23 million in 2000). The official religion is Islam and the official language is Bahasa Melayu.

Malaysia's economy has been one of the most robust in South East Asia, enjoying rapid development with an average annual GDP of 7.6% between 1989 and 1999. Although Malaysia had not been sparred from the 1999 Asian financial crisis, the government's prompt actions had resulted in the country registering one of the strongest recoveries within the region since.

Malaysia's GDP grew at 8.6% in 2000, mainly on the strength of double-digit export growth and continued government fiscal stimulus. As an oil exporter, Malaysia also benefited from higher petroleum prices. Higher export revenues allowed the country to register a current account surplus. However, foreign exchange reserves have been declining - from a peak of \$34.5 billion in April 2000 to \$29.7 billion in December 2000.

Policy and Regulation

The Malaysian telecommunication industry was previously highly regulated but since the inception of the New Economic Plan in the 1970's the GoM (Government of Malaysia) has made a concerted effort to liberalize the telecommunications industry. The market has been fully opened with the privatisation of the government telecommunications department in 1987 and the formation of the National Telecommunications Policy (NTP) in 1994. The GoM's Master Plan for the telecommunications industry provides, among others, guidelines for competition, interconnection charges, tariff rates and network development. Telekom Malaysia is Malaysia's largest telecommunications service provider.

Today, five companies make up the major telecommunication market segment, representing a mix of local and foreign owners, of public and private holdings, and of ongoing consolidation and mergers. The aim was to minimize duplication of resources and excess capacity, optimise network utilization and reduce the loss in foreign exchange due to expensive high-tech equipment. The sharing of infrastructure is already being done as companies realize that it is cheaper to lease an existing network than build their own. Most companies with networks have an over-capacity and are more than willing to lease their excess capacity.

Malaysia's IT and telecommunication regulatory environment underwent a major change with the enactment of the Communications and Multimedia Act 1998 (CMA). The Act defines a regulatory framework in support of ten national policy objectives for the communications industry:

- 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 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.

There are three main features of the CMA: it is pro-competition, it is technologically neutral and it aims to achieve universal service.

The computer and software markets are fully deregulated though restrictions do exist on participation in government bids, and equity restrictions on setting up manufacturing facilities. These barriers are relatively small and do not pose an insurmountable barrier but do encourage the establishment of joint ventures and local distributorships with Malay companies.

Malaysian laws protect the intellectual property rights of computer-related products through the Copyright Act 1987 and the Trade Description Act 1972. Malaysia has been a member of the World Intellectual Property Organization (WIPO) since 1989. The country is also a member of the Berne Convention and Paris Convention. Although the Malaysian government has taken a proactive role in addressing the issue of software piracy in the country, the practice remains.

The Enforcement Division of the Ministry of Domestic Trade and Consumer Affairs with the assistance of the Business Software Alliance (BSA) has made substantial progress in conducting raids on illegal manufacturers of pirated software.

Software piracy generally centres on popular desktop applications and games software. Products from local software developers are however not excluded from this illegal activity. According to the BSA, the software piracy rate in the country had declined from 82 per cent in 1994 to 71 percent in 1999. The value of pirated software, equivalent to the dollar losses to the industry had however increased by more than 20 per cent from US\$66.7 million in 1994 to US\$84.2 million in 1999. The increase in losses can be attributed to the increased growth and investments in the IT industry.

Malaysia does not limit the type and domains that consumers/businesses can access. Malaysia also does not have a censure on the ISP's and thus more and more people feel comfortable accessing and using the Internet.

Government Plans and Focus in IT Policies

Malaysia intensified its commitment towards the Information and Communication Technology (ICT) in the early 1990s with the setting up of the National Information Technology Council (NITC). The NITC is an advisory group chaired by the Prime Minister to drive the use of ICT as a strategic technology for national development.

The government is backing its ICT vision with a serious financial commitment. In the Eighth Malaysia Plan (2001 - 2005), RM5.2 billion (US\$ 1.37 billion) or 5% of the government budget has been allocated for ICT development. This budget includes government computerization, flagship ICT applications and projects to reduce the digital divide.

Malaysia's ICT strategy took on a more focused, balanced and structured approach in 1996 with 2 main programs: The National IT Agenda (NITA) and the Multimedia Super Corridor (MSC).

NITA provides a framework to utilise ICT to transform the entire Malaysian society into an information society, then to a knowledge society and finally to a values-based knowledge society. NITA views ICT development from three angles – people, infostructure and applications – with the concept that with the relevant skills, infrastructure and tools, people are able to use ICT to develop society.

NITA's socio-economic approach includes the provision of grants to communities and the Small and Medium Enterprises (SME's) that want to implement pilot IT projects such as E-community. Recognizing the need to involve all Malaysians in the NITA process, NITC launched the Demonstrator Application Grant Scheme (DAGS) in 1998 to fund and develop e-communities by encouraging Malaysians to participate in and utilise the opportunities made available by ICT.

The MSC on the other hand, predominantly focuses on the economic and industry development. It envisions the creation of an oasis for ICT companies to make Malaysia a multimedia hub. The MSC is primarily a top-down, centrally coordinated project designed to act as a catalyst for ICT industries and products by attracting and nurturing hi-tech companies. Besides enacting the first set of Cyber and convergence laws, and establishing the institutional market framework such as the Ministry and Commissions for Energy, Communications and Multimedia and the venture capital industry, MSC also tenders out Flagship projects such as the Smart School, E-Government, Multi-purpose Smart card and Telemedicine.

Under the Multimedia Super Corridor (MSC) plan, seven major flagship applications were identified to create awareness and to spearhead the ICT development within the nation. These flagship applications include:

- E-Government
 - o E-Procurement
 - Project Monitoring System
 - o Generic Office Environment
 - o Human Resource Management System
 - o E-Services
- Multi Purpose Smart Card
- Smart School
- Tele-health
- R & D Clusters
- E-Business
- Technopreneur Development

Both NITA and MSC are part of a bigger national vision to become an industrialized nation by 2020, with ICT and knowledge as the main drivers of growth. It's comprehensiveness include aggressive HR development, boosting public spending in R&D, and incentives to attract the right FDI's, in an attempt to move from the manufacturing-base to knowledge-base economy.

Impact

The MSC has attracted several leading ICT players to set up their regional development or support centres in Malaysia, thus providing opportunities for higher-paying jobs and value creation in the local industry. By end 2001, there were 621 approved MSC companies and fifty world-class companies (see chart below). Although the benefits of MSC have yet to impact the greater economy, there is a tremendous increase in public awareness on the importance of ICT, as reflected in the number of students pursuing IT and engineering courses.

The MSC Flagship projects have produced a few Malaysian companies capable of developing their own IP and products e.g. the multi-purpose smart card, mobile digital devices, Smart School courseware, and even encryption and compression software. Many of these companies are now aggressively going abroad to compete in the international markets. This is the early sign of success that the MSC is spawning world-class IT companies.



Source: Multimedia Development Corporation



Spread of MSC Status Companies

Source: Multimedia Development Corporation

Growth Area / Year	'97	'98	'99	'00	'01
Revenue (RM mil)	5,380	4,840	5,230	5,910	6,501
Growth (%)	9	-10	8	13	10
PCs installed	1.03 M	1.36 M	1.8 M	2.2 M	2.8 M
Internet subscribers	200 k	400 k	700 k	1.65 M	1.85 M
Internet Users	500 k	1.5 M	2.8 M	4.0 M	5.4 M
SMEs in IT	247	297	586	1,068	1,511

Growth of IT in Malaysia

Note: Excludes ICT equipment and components manufactured in Malaysia for the export market. Source: PIKOM, CMC, MDC

The GoM's aspiration to make Malaysia a regional hub for telecommunications as well as information technology (IT) has led to the development of Putrajaya - intelligent city/new government administration complex - and Cyberjaya. Putrajaya will be equipped with state-of-the art communications technology and IT infrastructure while Cyberjaya will be the focal point for the manufacturing of high value-added IT goods and services.

At the pulse of government ICT adoption is the Malaysian Administrative Modernization and Management Planning Unit (MAMPU), which is responsible for introducing improvements, efficiency and responsiveness in the public sector. In that regard, MAMPU is actively involved in the work of the NITC, the MSC Implementation Council and is the Secretariat for the Government IT and Internet Committee, as well as the Steering Committee on the Electronic Government (EG) program.

ICT Infrastructure

Malaysia presently has an adequate copper analogue system that is being replaced and expanded by a new digital fibre optic cable network to meet the increasing demand for capacity. T-1 service and ISDN service were recently introduced by one of the telecommunications licensee's Telekom Malaysia and are still quite low. The penetration rate rise is rising and this is mainly attributed to the upgrading of current infrastructure and the implementation of new technologies such as digital, fibre optics, broadband, wireless and cellular, ATM and ISDN.

One area of Malaysia's telecommunications industry that has been prospering is the wireless phone market. At end of 2002, Malaysians cellular penetration rate was about 30% - or about 7 million users - one of the highest in the region. The cellular market continues to grow and is anticipated to register double-digit growth rate over the next few years.

As of 2002, there are five mobile networks operators: Celcom, Maxis, Digi, TM Touch and TimeCel. There were many concerns for having five domestic service networks in a country of 23 million people for their cost, duplication and commercial viability.

Telekom Malaysia is the dominant telecommunication service provider. It has more than 3 million customers with a multibillion-ringgit investment program to upgrade and modernize its network. It first introduced cellular communication in the country in 1985 via Atur 450. More recently in 2002, Telekom Malaysia merged its mobile phone business, TM Touch with Celcom in response to the Government's call to consolidate the telecommunications industry to bring about greater efficiency in the mobile communications segment.

Malaysia has developed a satellite network with the launch of its own satellite (MEASAT1) in January 1996. As a result, an immediate and simultaneous point to point and point to multi-point telephone services is presently available throughout Malaysia's islands.

With the advent of the Internet, Malaysia has made a concerted effort to get connected. The GoM established Jaring (Joint Advanced Research Integrated Networking) as the gateway to Malaysia's information highway and until recently, it was the only access provider to the Internet. Jaring is owned and operated by the Malaysian Institute of Microelectronics Systems (MIMOS) and uses Telekom's infrastructure for its operation.

To date, there are two ISP's in Malaysia. At the end of 2002, there were over 4.8 million Internet users in Malaysia, representing approximately 19% of the population.

Human Resource Development

The Malaysian government has long recognized the importance of education for its national development and has increased the funds allocated for education form 7.5% in 1980 to 17.2% in 1989, which has resulted in a more educated workforce.

The GoM has recently been allocating increased amount of funds to the Education Sector. Consequently, increased educational benefits for the Malaysian people will start to show up in an 98 increased educated workforce and IT professionals, who are able to propel Malaysia's strong economic growth in the IT field. These improvements may not produce an immediate effect but will have a big payoff in the next ten to twenty years. There are approximately 44 higher learning institutes, 26 private institutes; and about 45 student and club associations.

There are approximately 50,000 software professionals out of a working population of about 8 million but not all of them have strong educational background. This indicates a severe shortage of IT professionals and the Government is working hard to improving the standards of educational institutions and to overcome this problem over the long term.

Malaysia has a severe "brain drain" problem especially in information technologies, as the more talented professionals look for a better technical education and more challenging work abroad. The labour force manning the assembly plants is not skilled enough to man the new industries that the Government wants to attract. This issue is being addressed by allowing MSC-status companies to employ foreign talent with a quick immigration process.

IT Industry

As in many other countries, computers are widely used in Malaysia in banking and insurance sectors. These sectors have government-linked large companies with multinationals. Most companies give priority to their accounting needs whereas small and medium size companies usually concentrate on computerizing their accounting and financial systems before moving on to other areas of management.

Malaysia aspires to be a software exporter in the future and seeks to position itself as a regional centre and hub for value-added activities such as software research and development, IT training and education and warehousing and distribution.

Hardware

Malaysia is the third largest producer and the largest exporter of semiconductors. In 2000, it produced 16.4 billion units worth of semiconductors, an increase of 64.7% over 1999. The increase in the production of E&E parts and its components was due to the increase in worldwide demand for computers and telecommunications equipment, especially in the Asia Pacific region. Companies producing semiconductors in Malaysia include Advanced Micro Systems, Harris, Hitachi, Intel, Motorola, National Semiconductor, Hewlett Packard, NEC, Phillips, SGS-Thomson and Texas Instruments.

Electronic and electrical exports of Malaysia, mainly industrial electronics and its components accounting for RM219.6 billion in the year 2000, which was 71.3 per cent of the country's total manufactured exports, as against 69.8 per cent in 1999. USA stood far behind with 26.8 per cent, with a total export value of RM58.9 billion, followed by Singapore and Japan.

The Malaysian electronic and electrical industry is still focused almost exclusively on final assembly operations, with relatively low value added. The Malaysian electronic and electrical exports are expected to move upstream, as multinational electronics firms invest in wafer fabrication facilities. Near-term investment is expected to focus on increasingly sophisticated assembly and test equipment, required to raise labour productivity and produce higher value-added items.

Services

As with the other segments of the IT market Malaysia's service sector is still developing. In recent years, the IT services sector has grown faster than the hardware market. Growth areas include customized software development, outsourcing, shared services, and IT consulting in e-commerce and security.

Progress and Challenges

Progress

- Enabling policies and regulations e.g. CMA, Cyberlaws
- World-class infrastructure and highly competitive telecommunication service providers to ensure lower rates of telecommunication services.
- Leading hardware exporter e.g. third largest producer of semiconductors and largest exporter in the world. Malaysia aspires to be a software exporter in the future. One of the many initiatives in this direction is the creation of Multimedia Super Corridor and Technology Park Malaysia.
- Strong partnership between government and private sectors by providing funding or incentives to ICT industry e.g. creation of Malaysian Debt Venture Corporation with a fund total of RM 1.6 billion to support and encourage ICT research, development and commercialisation. Investment by MSC status companies – 612 companies as of 2001 with good spread in terms of ownership structure and technology focus.
- NITA's e-community initiative has resulted in the Subang Jaya Township Community project. Dubbed as SJ2005, this e-community project serves as a test bed for community migration to the e-world.

Challenges

- Shortage of skilled IT professional at the national level. This is due to lack of initiatives in the area of human development programs at the national level and insufficient resource planning to fulfil the skill requirement in the new industries and businesses.
- Most of the ICT/ IT companies are still at their infancy/ development stage and yet to have full impact on national GDP.
- High piracy rates discourage innovation and patenting of intellectual property.
- Lack of marketing and commercialisation capabilities at the international level among ICT companies.
- Despite the huge investment in ICT and MSC, there has not been any significant improvement in the productivity of Malaysian companies at the national level.

A2 - United Arab Emirates

he country with seven emirates known as the United Arab Emirates (UAE) is one of the most developed in the Middle East. The country's wealth e.g. high per capita income and a sizable annual trade surplus are based on oil and gas output (about 33% of the nation's GDP). Its economy is dependent on the prices of these commodities. The UAE has undergone a profound transformation from an impoverished region of small desert principalities to a modern state with a high standard of living since early seventies.

Early 2002 has seen some interesting changes in the way the government carry out their services to the public through the new e-government services. It has eased the way the residents deal with the government¹. The Dubai government has put forth an e-government initiative that will enable breaking down barriers of government departments by providing a one-stop shop for all public services.

Policies and Regulations

Although the world is moving towards globalisation through privatisation and deregulation, the UAE however, seems to be immune to such global pressure. The privatisation of the state-controlled telecommunications provider has been suggested but few steps have been taken to open the market to competition. The Ministry of Communications is the primary regulatory body in the UAE. Emirates Telecommunications Corporation (ETISALAT) is the sole telecommunications provider in the Emirates.

The UAE government owns sixty percent of ETISALAT while private investors control the remaining forty percent. ETISALAT is one of the most profitable telecommunications organizations in the Gulf region, comprising almost thirty percent of market capitalization in the UAE, or approximately \$27 billion. Although private investors control forty percent of ETISALAT, the government still completely dominates the telecommunications industry.

Even though the country has a relatively free economy, competition is still basically non-existent in the telecommunication services in the UAE, thus giving ETISALAT the natural monopoly.

Evidence shows that ETISALAT has actually been quite successful in keeping up with modern technology standards, which will enable it to further advance its goals of economic diversification. Companies and businesses from around the globe will be increasingly drawn to the UAE for its strong telecommunications infrastructure and lack of significant barriers to trade and investment.

The policies of the UAE government regarding the advancement of information technology have been aimed at encouraging investors to establish their enterprises in the UAE and at assisting local business people. It has consistently supported policies to create an atmosphere in which trade and industry can flourish. The \$13.4 billion budget allocated for telecommunications, information technology and the

¹ Inter Press Service

development of other non-oil sector shows the commitment of the government of UAE to help the nation move towards the ICT and away from dependency on its oil reserves. It is currently amidst a 20-year economic diversification plan to help encourage continued growth.

In stimulating foreign investments into the country, various incentives and policies have been created. For example, it is relatively easy to get a visa, residence permit, and a work permit. U.S. citizens are eligible for 10-year, multiple entry visas. Nationals from other countries, with the exception of Israel, can invest in the UAE. Citizens of Gulf Cooperation Council countries, namely Oman, Qatar, Saudi Arabia, Kuwait and Bahrain as well as British citizens can enter the UAE without any visa.

The government has taken proactive steps in stimulating direct investments, inflow and outflow of foreign firms into the country. There is no restriction on the transfer of funds into or out of the UAE. Customs regulations are minimal, which is also an enticement to foreign firms. Furthermore, a flat rate of 4 percent is levied on imported goods, unless they are being sold directly to the government in which case the transaction is tax-free. No exchange controls or restrictions on repatriation of profits are in place in the UAE. This is very significant because with foreign direct investment inflows comes increased technology and thereby increased technology demands.

The central government and each emirate share the responsibility in regulating businesses in the UAE. Although in general, the government wants to attract foreign companies into the country, its policy of ownership where foreign companies must have at least 51% ownership by a UAE national discouraged inflow of foreign IT companies. However, the government has established ten free trade zones where foreign ownership is allowed and encouraged. Businesses operating in these zones are exempted from the ownership policy and do not have to pay corporate and income taxes.

In Intellectual Property rights protection, it is noteworthy that there has been a steady decline in piracy throughout the UAE and the Middle East, which can be partially attributed to the rising awareness about the harms of illegal copying and efforts provided by many Middle East governments to protect software copyrights. The 2002 Global Software Piracy Study revealed that UAE maintains the lowest software piracy rate within the Middle East region with only 41%². The UAE's copyright law was introduced in 1992 and, since then, it has taken considerable initiative to stamp out piracy from the Middle East.

Cyber Crime:

Another concern is the increasing cyber crime that is becoming more serious when more information and transactions are done over the Internet. When more and more people are interested and trained in the areas of IT and other technologies, knowledge on hacking and intrusion into private information becomes more accessible.

Pornography:

The UAE has been recognized as the regional leader in advocating censorship of the Internet through the use of high technology methods. The government relies on the commitment by the stateowned ISP, ETISALAT, to carry out monitoring activities and blocking x-rated materials from being

² Seventh Annual BSA Global Software Piracy Study, 2002

viewed by surfers from the nation. The government clearly states that there is no restriction on the political, social and economic side of information available on the Internet but any dial-up users to ETISALAT's proxy servers will be blocked from accessing any objectionable materials and websites³. Although the proxy filtering system is not foolproof, the government is continuously trying to make sure that negative content such as pornography or sexually explicit will be blocked.

The government monitors these concerns as the domestic legal environment in which the emerging information technology industry operates has significant impact on the number and type of obstacles faced in both the domestic and international markets. This is particularly significant for IT because it is an emerging industry and legal questions are still being resolved.

ICT Infrastructure

The UAE has a modern telecommunications infrastructure compared to other countries in the region. It has frequently been referred to as the "most wired" state in the Middle East. The Emirian citizens have relatively unhindered access to all modes of communication that western nations do.

In the mobile communication industry, even though GSM prices were reduced, the cost of other telecommunications services remains severely inflated. It is still more expensive for an individual residing in the UAE to dial directly into an Internet server in a neighbouring country than to pay ETISALAT's fees. The digital GSM 900 became fully operational in the UAE in the late 1994. Subsequently, GSM became the primary platform of communications between the residents. The total subscriber base for GSM reached 1.17 million people in 2000. Furthermore, with roaming agreements with over 77 countries, it has become a popular mode of communication for frequent travelers both to and from the UAE.

The launching of the Al-Thuraya satellite, which is primarily owned by ETISALAT, shows that satellite technology use is increasing. It is a two geosynchronous mobile satellite system costing about \$1billion that has the capability to provide data, voice, global positioning, and mobile communications to over 100 countries. The Al-Thuraya satellite program is perhaps the most significant technology-related undertaking in the UAE. It is symbolic of the degree of emphasis that the UAE is willing to put on the advancement of modern technology.

Currently, Emirates Internet and Multimedia (EIM), established under ETISALAT, is the first and only Internet Service Provider (ISP) in UAE. According to the UAE federal law, competitors are not allowed to enter the market. While the number of Internet subscribers is 240,000, the actual number of Internet users is about 775,000⁴.

A study of \$9 - \$11.5 million worth of e-commerce transactions in the Middle East revealed that there are increasing trends towards positive acceptance of the Internet being used as a means of electronic commerce. There is no doubt that e-commerce revenues in the UAE have grown significantly. This same survey revealed that Arab software companies expected that up to one-third of their transactions would take place through the Internet in the next two to three years. Although the UAE is leading the Middle East nations in pursuit of e-commerce objectives, other nations in the region have also undertaken similar initiatives. For example, in Egypt, a number of commercial firms are already offering services through the

³ Sourced from www.hrw.org

⁴ www.itu.int

Internet. In fact, the Cairo supermarket has established a World Wide Web site where consumers can order their groceries on-line for home delivery.

The government has spent billions of dollars to transform the nation into a modern and connected society. Information technology firms from around the world have established businesses and domestic computer-related firms seem to be springing up regularly. Perhaps the most significant draw to the UAE is the competitive environment with limited regulations on trade and services. Furthermore, the location provides a window to the east and the west.

UAE has created ten free trade zones to attract Foreign Direct Investment. Each offers open, liberal, pro-business environment where 100 percent foreign ownership is allowed. The zones have attracted a significant amount of foreign investment. The three most significant areas in the UAE for foreign investment are Sharjah, Dubai, and Abu Dhabi.

Dubai Internet City

Dubai Internet City (DIC) is known as among the first complete Information Technology and Telecommunications Center in the world to have been built inside a free trade area, the Dubai Technology, Electronic Commerce & Media Free Trade Zone. It was conceived and constructed within one year, officially opened in October 2000 at a site to the west of the city, adjacent to the new Dubai Marina development. The DIC allows 100% foreign ownership of companies, and policies relating to partnerships with local sponsors are relaxed. Corporate revenues, sales, and private income are exempted from any form of taxation. Companies can take land on a renewable lease of up to 50 years and build their own offices.

Dubai is continuously improving its policies and infrastructure over the past ten years in order to attract significant investment by information technology related companies. It has become known as a regional marketing, distribution, and recently, assembly centre for the Middle East. It was established as a means of attracting both venture capitalists and foreign direct investment in the information technology industry. This particular free trade zone will further help the government realize its goal of diversification and development of non-oil industries. The Dubai Technology, E-Commerce and Media Free Zone Authority under the chairmanship of His Highness, Sheikh Maktoum bin Mohammed bin Rashid Al Maktoum, is fast becoming the global media and IT hub⁵.

The DIC also hosts a variety of offices, shopping malls, exhibitions and recreational facilities. As of June 2000, over 100 companies were licensed to operate in the DIC and over 350 more had applied. If all outstanding applications were accepted it would be at around 80 percent capacity. Estimates suggest that thus far investments total approximately \$250 million. Current statistics show that there are about 5,500 workers of 102 nationalities in the DIC.

DIC's mission is "to create an infrastructure, environment and attitude that will enable ICT enterprises to operate locally, regionally and globally, out of Dubai, with significant competitive advantages⁶." In other words, the DIC is intended as a business environment that will nurture ICT and serve as a strategic base of operations for them. It is the largest IT infrastructure of the Middle East, and

⁵ www.arbitrators.org/

⁶ www.earthtimes.org/

has the most extensive commercial Internet Protocol telephony system in the world, with its own satellite station and Internet feed.

The DIC has recently established a new project called the Knowledge Village where the facility is now being built next to the 400-hectare DIC and Dubai Media City. The village is planned to set standard for an industry-oriented learning method through providing infrastructure for developing, sharing and applying knowledge. Several top universities from the West have expressed interest in making the Knowledge Village their teaching conduit in the Middle East, using the latest e-learning facilities⁷.

Human Resource Development

In developing the country's human resources and capabilities, the government has implemented policies and programs to encourage citizens to pursue higher education, specifically training in engineering and information technology. Primary, secondary, and higher education is provided free to all Emirian citizens.

The population is currently comprised of only about 25% of local nationals and even less of the labour market. The IT labour market is composed primarily of expatriates. Over the last decade, the UAE has become the hub for telecommunications and information technology in the Middle East and is therefore attracting IT professionals from around the globe. The primary problem that the UAE will face in subsequent years will probably be a lack of Emirians in the work force. Attracting foreign investment and IT professionals into the domestic labour market will continue as long as the UAE maintains a relatively liberalized economy.

The UAE government has taken various steps in encouraging people with necessary skills and experience to come and work in the UAE, this is also known as the emiratization. With regard to IT consulting and internetworking services, Emirian companies compose about 50 percent of the market (or \$5 million) U.S. companies 30 percent, and third party countries about 20 percent of the market share. An exact estimate of the number of local IT professionals entering the market each year is unknown; however, there is no significant risk of "brain drain".

The UAE government places a strong emphasis on education in order to meet the challenges of the evolving telecommunications and computer industries. The UAE government officially recognize only six universities, even though 33 private universities reside in the country. UAE students comprise only about 10 percent of enrolment. Higher education is provided free to all citizens. The UAE has placed a strong emphasis on educating their youth on the latest trends in telecommunications and Information Technology. This will become increasingly important as the younger generations begin to enter the work force throughout the next two decades. ETISALAT, the state-owned primary telecommunications provider in the UAE, has recently initiated a program that encourages the use of Internet in public and private schools throughout the country.

Hardware

The country is a net importer of hardware technology as there are little locally assembled hardware components available in the market. This may, however, change in future with the unveiling of Dubai

⁷ www.gulf-news.com/

Internet City. Taiwan and Hong Kong are the primary exporters, with the U.S. following closely behind. A large market exists for the purchase and sale of hardware technology. The Emirians are willing to pay top dollar for quality products. The nation is not globally recognized as a hardware manufacturer, and there are no niches in which it dominates.

It is interesting to note, that the majority of the hardware resellers are only located in the relatively modernized Emirates of Abu Dhabi, Dubai, and, to a lesser amount, Sharjah. Furthermore, the foreign owned companies are primarily in the Free Trade Zones because of ownership requirements. The United Arab Emirates has numerous subsectors in the hardware market and each is projected to grow substantially.

Software

The UAE has established itself as the IT capital of the Middle East region. The software market is robust in the UAE, compared to other countries in the region. The lack of significant trade barriers to the presence of foreign competitors has spurred the growth of the industry. The UAE is neither a net outsourcer of software nor is it recognized as a global or regional player in the industry. The domestic market includes both distributors of imported products and to a lesser extent, developmental firms. There is plenty of room for growth, as numerous untapped sub-sectors still exist.

Local and foreign companies overwhelm the domestic software market, as UAE does not impose any trade barriers on investors, which makes it an ideal place to operate such a business. Software companies from around the world are drawn to the UAE free trade zones for tax-free, relatively unhindered competition. The software market is, however, marginal outside the fee trade zone. The prime geographic areas for the software industry are unquestionably Dubai and Abu Dhabi, with limited investment in Sharjah.

Financing

The government plays a very significant role in the UAE financial marketplace. In terms of the government's role in IT financing the government has been very supportive of the DIC. In fact, the initial infrastructure, costing over \$700 million, is funded entirely by the government. Private investors may be able to take part in the future, however, this is not guaranteed yet. The government of the UAE also owns the Dubai Stock Market, the only official stock market in the UAE.

Government IT Initiatives

E- Government

The philosophy behind UAE's idea to implement e-government services for its residents is in automating public services, permitting realization of the e-government vision, and being able to undertake advanced administrative policies. In order to encourage and stimulate the growth of information technology in the UAE, many individual emirates have established IT-related departments. For example, in Dubai, the Chamber of Commerce has set up a department to handle electronic commerce related issues and to encourage the development of on-line business.

Guideline for a National IT Strategy

The Dubai government has made significant progress in migrating its basic services to be available online, especially those offered to businesses and individuals. Services related to visa and driver's license applications, birth and marriage certificates, job search, utility payments, registration of new companies, municipality permits and fees, customs declaration and other basic services can now be done electronically. The government is using the Internet as a means of cutting down on paperwork and lowering labour costs by automating the system. Currently, about fifty percent of the e-services for businesses are fully transactional online, while about thirty percent are ready for use by the citizens⁸.

Dubai's e-government aims to provide easy access both within and outside of government departments by introducing online a one-stop shop for all public services. It is designed to have trouble-free access to all sorts of data on Dubai, both to residents and foreigners through its website, www.dubai.ae. Another interesting development in terms of e-government is the use of e-commerce solutions by the Dubai Ports and Customs. In June 2000, the Dubai Ports and Customs launched E-Mirsal. It is the first e-government, e-commerce solution that allows agents, shippers, transport companies, and other cargo businesses to process customs clearing documents and payments via the Internet.

Tejari.com

Tejari.com is an initiative spearheaded by the UAE government to link business-to-business ecommerce transactions. It is owned and operated completely by the Government of Dubai. The Dubai government has said that it intends to make all future purchases through it. Tejari.com has quickly become the premier digital marketplace in the Middle East. The Dubai Development Board has recently named Tejari.com as one of its key partners in introducing new project management and collaboration tool. This will enable the organization to reduce project costs for many of its housing initiatives and shorten the delivery cycles by sharing documents and plans with construction partners online⁹.

Tejari.com is open to all businesses and industries globally and not limited only to Emirian businessmen. One of the primary attractions to using this system for B2B is that it does not require proprietary hardware or software like many similar programs. Transactions on Tejari.com are secured through encryption technology using the 128-bit Secure Sockets Layer. Because of the high level of security Tejari.com has become very popular in a short period of time.

Progress and Impact

- The UAE government's serious commitment to reduce illegal software copywriting has resulted in its achieving the highest reduction in piracy rates worldwide. This will help to further spur the development of the software industry.
- Dubai in particular has the most modern telecommunications infrastructure as compared to other countries in the region.
- UAE currently has ten free zones, which offer open, liberal, pro-business environment where 100 percent foreign ownership is allowed. E.g. Dubai Internet City and Dubai Media City.

⁸ www.gulf-news.com

⁹ www.tejari.com

• The UAE government's liberal policy and its strategic location in the Gulf have attracted many talented expatriates, making UAE as the country with one of the largest expatriates in the world. Therefore, a pool of skilled IT professionals can easily be sourced from within the UAE.

Challenges

- Slow privatisation and deregulation efforts may discourage foreign direct investment flow into the ICT sector. For example, the Emirates Telecommunication Corporation (ETISALAT) is the only telecommunications provider in the Emirates. Most other industries are either partially or fully liberalized.
- For UAE in general and DIC in particular, the challenge is to seek other means beyond excellent infrastructure to develop the ICT market and industry.
- No cohesive national strategy, as other parts of UAE are not actively involved.

A3 - Egypt

Which a population of about 68 million (in 2000), Egypt is the most populous IDB member country in the Middle East. It has improved its macroeconomic performance during the 1990s, mainly through a combination of external debt, sound fiscal and monetary policies, and structural reforms such as privatisation and new business legislation. This has helped to tame inflation, slash budget deficits, build up foreign reserves, and resulted in increased foreign investment. By 1998, however, the pace of structural reform slackened, and lower combined hard currency earnings resulted in pressure on the Egyptian pound and sporadic US dollar shortages. Monetary pressures eased somewhat when the economy benefited with the 1999-2000 higher oil prices, a rebound in tourism, and a series of minidevaluations of the pound.

Policy and Regulations

The strong geo-political position and relatively resilient domestic economy of Egypt have enabled the country to withstand the gathering international momentum behind privatisation throughout most of the 1980's and 1990's. The Government of Egypt (GOE) joined the global telecommunications restructuring effort only in 1997, when it fully corporatised the telecommunications entity, Telecom Egypt, formerly known as ARENTO.

The first telecommunications foray into public placement was in January 1998 with an initial public offering of 30 percent of the \$177 million Egyptian Mobile Telephone Services Co. While still dominated by Telecom Egypt (28%) and institutional investors (39%), it laid the groundwork for additional public offerings.

The government has embarked on a program of progressive market liberalisation. A bid for a license to install and operate a second GSM network resulted in the creation of Misr-Fone in November 1998. Within seven months of operation, it had 180,000 users and is predicted to top 300,000 by 2000. In its first four months it subscribed 100,000 customers, one of the highest success rates of any new wireless telephone network.

The Ministry of Communications and Information Technology has oversight over the telecommunications and Internet sectors. The Telecommunications Regulatory Authority (TRA) was established by a presidential decree in 1998 to function as an independent industry regulator.

Legal Environment for IT

Egypt is a contracting party to the Berne Copyright Convention and Paris Patent convention. It is also a member of the World Intellectual Property Organization. In 1992, the government amended the 1954 Copyright Law with Law 38, with which computer software was specifically protected and penalties
for piracy were increased substantially. In March 1994, Law 29 classified computer software as a literary work, which provides protection for a 50-year period.

This was followed by a further refinement of the patent law in order to comply with the Trade in Intellectual Property Rights (TRIPS) provisions of the World Trade Organization's Uruguay Round. Negotiations were overly protracted because of resistance from the pharmaceutical and chemical industries (virtually no protection afforded to intellectual property in these industries).

Another recent government initiative to combat software piracy was the reduction of customs duties on software from 35 to 5 percent.

There is no specific legislation protecting semiconductor chip layout design, although Egypt is a signatory of the Washington Semiconductor Convention. The lack of sophisticated hardware design and production facilities and the continued predominance of hardware importation obviate the need for such specific legislation.

Widespread copyright piracy has been noted in the following areas: videocassettes, sound recordings, printed matter (particularly medical textbooks), and computer software. Even with the above legislation, inconsistent enforcement and isolated prosecutions have made it difficult to substantially reduce piracy in the end user, and the small business user segment.

Internet Censorship

Egypt has set up censorship offices for practically all media, except the Internet. So far there are no laws specifically regulating speech online. No efforts to censor, block, or punish online speech in Egypt have been reported, and ISPs are not required to submit information about the identities of Internet subscribers, or get clearance before issuing accounts or hosting websites.

Government Activities/Plans in IT

One of the initial efforts of the government in developing the high technology sector was the creation of the Information Decision Support Centre (IDSC). The IDSC is charged with implementing and managing the Egypt's technological development, while its subsidiary, the Technology Development Program (TDP), is specifically charged with technological development in industry. Closely related, the RITSEC (Regional Information Technology and Software Engineering Center) was established in 1992 through multilateral donor funding. As part of its mission, the IDSC established the Information Technology Institute (ITI) in 1993. Its purpose was to supplement the number of Egyptian IT professionals by providing specialized IT training. The graduates from ITI are consistently rated highly by the IT market because of their familiarity with the latest technologies and for possessing excellent, relevant programming skills.

The IDSC/RITSEC partnership, joined by Egypt Telecom in early 1996, began laying the foundations for widespread Internet access by developing an Internet backbone and gateway facility. In March 1996 this infrastructure began to be utilized by the first IDSC/RITSEC licensed ISPs. Expanding beyond the capital and increasing the number of ISPs (16 to 40) brought increased usage from 25,000 in early 1997 to 300,000 users in 2000.

RITSEC played a critical part in the creation of the Regional Arab Information Technology Network (RAITnet) in December 1994. This development of a regional initiative is to complement IDSC's domestic effort, with the goal to supply software and services to neighbouring Arab countries. The main objectives of RAITnet are:

- To support the acceleration of the software industry in the Arab region.
- To maximize the utilization of the technical resources available for the software industry in the member countries.
- To help exchange experience among professionals in IT.
- To follow state-of-the-art international developments in the software industry.

IDSC was also responsible for implementing the Egyptian Information Highway Project in late 1995 to help development of Egyptian content on the Internet.

ICT Infrastructure:

Domestic

In the late 1990s, the number of telephone lines had grown nearly ten times from the 1980's to reach 6.7 million lines and a teledensity (number of telephone lines for every 100 people) rate of 11.1. The number of communities with phone access is concentrated in the cities of Alexandria and the capital, Cairo. The quality of service has greatly improved with fibre optic technology, and automatic and digital exchanges.

The Public Data Network (PDN), Egyptnet, is an X.25 based network providing coverage primarily in the populated urban areas of Cairo, Alexandria and Suez. It provides X.25 connectivity at speeds up to 19.2 k via leased lines or X.28 dial-up access. There are ongoing efforts to increase the speed, as well as, the geographical coverage of the PDN.

International

Egypt is quite well connected to the international network, the major one being the fibre optic connection to Europe and Japan. Egypt's international connectivity also includes the fibre optic SEMEWE-2 cable, as well as INTELSAT and Arabsat satellite services.

As of mid-1999 there were approximately 35,000 to 40,000 registered and paying Internet subscribers. However, with a ratio of 2.5 to 4.5 users per Internet subscriber account, there are, in effect, over 180,000 Internet users. This is equivalent to 0.18% of Egypt's 66 million citizens having access to the Internet. Although this is very small, the growth in the number of actual users has been impressive since then, despite the relatively high cost of access.

From the initial 12 ISPs established after the declaration of an "Open Door" Policy (1996) with regard to Internet provision, the number had more than quadrupled to over 50 by 1999. As these numbers suggest, this service has proven to be one of the most aggressive and successful of the liberalized communications activities, particularly in light of the limited number of paying users.

International connectivity is also negatively impacted by particularly high rates - leased circuits to other countries carry an Egypt Telecom surcharge that can be two to three times the cost of the leased line itself. This has somewhat slowed the development of the software sector, negating Egypt's potential advantage of having a low-wage, highly trained software professionals.

Egypt, with a total international bandwidth of 550Mbps¹⁰ following the launch of government backed international connectivity provider, Nile-Online, has the most capacity among countries on the African continent

Human Resource Development

Egypt is well-known for its tradition of having respected universities and educated professionals. However, this has not translated to a sufficient number for the IT market. Currently Egypt has a serious shortage of staff, training and expertise in Project Management, Marketing and Sales, Middle Management, Business Analysts and some specific skill issues for programming staff.

This shortage of IT-skilled staff is due to several factors. One is the fact that the IT industry is still relatively young. Another is the slack in Egypt's economic liberalization process. Both these factors have not yet generated enough seasoned personnel to fill the demand. Simultaneously, staff having the necessary prerequisites will leave and open a competitive organization.

ICT market and E-commerce

The government is presently the largest single buyer and user of IT in Egypt, accounting for one quarter of Egypt's total demand. In terms of sales, the banking sector follows the government as the most important customer. The private sector and individuals fall into third and fourth place respectively. Private sector and household demand is primarily for downsized systems, while government requirements are still based on centralized systems and therefore entail client-server solutions.

The growth of the domestic marketplace for IT products and services has turned soft in recent years, in line with worldwide slow growth of the industry. Most of the domestic demand is at the high end of the marketplace, where multi-national firms are providing most of the services.

The GOE has managed to pursue several industry development objectives with the creation of high technology centres, where the provision of tax incentives, superior infrastructure and geographic proximity are combined to provide the catalyst for the nascent high technology sector. By locating these centres away from the densely populated urban centres it is hoped that the high technology core industries and the surrounding support service sectors will alleviate urban overcrowding and disperse growth more evenly throughout the nation. To this end, the Technological Development Program (TDP) plans to establish four such technology parks:

- Sinai Technology Valley (STV)
- City of 6th of October
- Nag Hamady
- Sohag

¹⁰ African Internet Connectivity, Information & Communication Technologies (ICTs) Telecommunications, Internet and Computer Infrastructure in Africa, http://demiurge.wn.apc.org/africa/

Guideline for a National IT Strategy

Of the above four projects, only the first is in its implementation phase. It is located directly east of Ismalia on the Eastern Bank of the Suez Canal. The STV aims at attracting international investment in many critical industries such as Information Technology, Communication Technology, Medical Technology, Industrial Automation Technology, Biotechnology, Environmental Technology, and many other areas critical for development into the twenty first century. This project will result in the establishment of a highly needed wide industrial base in Egypt, which can only be established through the transfer of technology, target training, and specialised and continuing education. This transfer of technology will be guaranteed through the attraction of foreign investment into the STV. Major international industrial companies will be invited to benefit from the prime strategic location of the STV, East of the Suez Canal, linking the European, African, Middle and Far East markets, which will enhance the benefits provided by the STV to suit and meet the requirements of even the most rigorous of investors.

The e-commerce sector of the Egyptian economy is still in its formative stages, with interested organizations, both public and private, attempting to promote the potential of this new field to the Egyptian business community. The National E-commerce Committee under the Ministry of Trade was founded in early 1999. This committee was responsible for advocating to government ministries and critical decision-makers to gain support for a national electronic commerce initiative. The Ministry of Trade at a national information technology conference declared such an initiative in September 1999.

Hardware

The local electronics industry may still be regarded as underdeveloped: actual manufacturing is limited almost exclusively to assembly operations. The primary limitation to the local manufacture of electronics is the lack of locally supplied primary products – an estimated 75 percent of all inputs and components are imported. This underlying lack of a primary product industry is a result of Egypt's small market size vis-à-vis the large capital investment necessary for production facilities.

The obvious leader in Egypt's hardware sector is the consumer electronics segment, which has surpassed the 50% level of local integration. This segment's success is the result of a combination of factors – it is the oldest of electronic technologies and the most populist electronic product for a developing country. The segment is also assisted by high import tariffs (up to 50%) on finished electronic products; however, smuggling and customs evasion are negatively impacting local sales. Based on 1992 performance, forecasts by market researcher Elsevier Advanced Technology suggest an annual rise in local production of electronics goods of 28 percent per annum up to 2000, based primarily on increased local assembly of consumer electronics.

Software

Egypt has traditionally been the fastest growing IT market in the Middle East. The ICT sector is one of the largest in the Arab region. The main drivers of this growth are sales of software, services, networks and PCs. Egypt has been able to establish a credible software production industry serving the domestic and regional market by virtue of its cultural pre-eminence, large market size and professional base. A 1998 study conducted by the Harvard Computing Group estimates the domestic software sector at around US \$50 million, consistent with estimates from the Egyptian Software Association (ESA). This compares with a 1994 total market size that was estimated at \$35.5 million.

The same study estimated that approximately 120 Egyptian firms are engaged in software production. The firms range from 1-5-person start-ups through relatively mature firms with more than 50-150 employees. As is the case with most private industry investment in Egypt, other than the tourist sector, the majority of these companies are located in and around Cairo or Alexandria. Government incentives and infrastructure investments have resulted in a number of new software companies locating in the new industrial areas of 10th of Ramadan and 6th of October cities.

A majority of Egyptian software companies are focused on producing packaged, tailored and Multi-media applications. The packaged software category, most of which is imported, accounts for an estimated 74 percent of total software revenues. Primarily, this category consists of system-level tools, office, and cross-industry and vertical application packaged software. The development of local ready-made packages, Arabization and turnkey contracts constitutes 45 percent of software sales, of which the first accounts for 19 percent of revenues. Ten percent is generated through Arabization, and the remainder by large-scale contracts.

Of the approximately 120 software companies, only 15-20 are actively engaged in exporting software. Eighty percent of the software exported by these companies goes to Saudi Arabia and other Gulf countries. Although the percentage of companies exporting, in comparison to the total, is relatively small, their exports account for 20 percent of regionally developed software. Furthermore, the increasing prevalence of IT in regional markets portends strong prospects for Arabization activities in Egypt for the foreseeable future. In 1994 exports of locally developed software were estimated at \$4.9 million, representing 25 percent of the \$19.525 million in total local development revenues.

Financing

Although there has been some restructuring in the banking industry to provide an environment conducive to entrepreneurial effort, there does not appear to be a significant effort underway to create regulations or incentives to encourage venture or seed funding. Currently, the only formal incentives available to start-ups are those based on strategic business sector and location incentives offered by the government.

Venture capital formation is still in its infancy, in part due to the small, family-dominated nature of the private sector. Since financing options available to IT companies are very limited, these start-ups must rely on the "small, family dominated nature of the private sector" and either self-finance or find individual or corporate investors.

Progress and Impact

- Young well-educated workforce
- The government's incentives, a work force well-trained in software engineering, and liberalized economy have enabled Egypt to have a software industry that is capable of serving the Gulf region and other Arab-speaking countries.
- Good ICT infrastructure, especially in the major cities.
- The whole of the ICT sector is also one of the largest in the Arab region.

Challenges

- Lack of national initiatives to create and sustain demand in the domestic marketplace.
- To increase the pace of liberalization of the telecommunications and Internet market, so as to make costs more competitive. This will help the development of the software and services industry.
- The lack of financial support and institutions, particularly for venture capital and seed funding for IT start-ups.
- Limited distribution skills in international software marketplace.
- Adoption of E-commerce is severely constrained because credit cards are not widely used for consumer purchase.



A his is an oil-based economy with strong government controls over major economic activities. Saudi Arabia has the largest reserves of petroleum in the world (26% of the proved reserves), ranks as the largest exporter of petroleum, and plays a leading role in OPEC. The petroleum sector accounts for roughly 75% of budget revenues, 40% of GDP, and 90% of export earnings. About 35% of GDP comes from the private sector. Roughly 5 million foreign workers play an important role in the Saudi economy, for example, in the oil and service sectors.

In the late 1990s, the government began privatising the telecommunications company followed with the electricity companies. The government is expected to continue calling for private sector growth to lessen the kingdom's dependence on oil and increase employment opportunities for the growing Saudi population (about 20.3 million in 2000).

Policy and Regulations

The privatisation of the telecommunications market began very slowly and in a small way in 1992 when private companies were allowed to sell paging services, although the government PTT had control over services or pricing. In late 1995 and early 1996 the GSM 900 digital cellular network became operational in the Kingdom. Other deregulations allowed subscribers to transfer the service to whichever they wanted.

In December 1997, King Fahd Bin Abdul Aziz, chairman of the council of ministers announced the privatisation of telecommunication services and the set-up of a private company – Saudi Telecom Company (STC) to run its telephone and telex facilities. This was the first major move towards privatisation. As of this final report (May 2003), the IPO of 30% of Saudi Telecom Company has been successfully completed in January 2003, with its public offer three times oversubscribed and the Saudi treasury enriched by around \$3 billion.

Most of the programs and initiatives of the governments are located or hosted by the educational institutions in the country. In addition, several programs also exist in some of the government-subsidized businesses and in government agencies. In fact, the National IT Plan (NITP) project, launched by a decree of the Crown Prince in late 2001, is steered by a committee under the Ministry of Interior. The committee has recently formulated a 5-year IT plan with the following objectives:

- Improve IT industry in Saudi Arabia.
- Promote IT investment.
- Use e-commerce to promote Saudi made products.
- Provide more job opportunities.
- Provide more jobs for women.

- Lower government spending on IT.
- Reduce human and administrative cost in the government.
- Provide better education.
- Provide remote education services.
- Utilize IT to provide better service to the citizens.
- Provide better telecommunication services.

The core objective of Saudi Arabia's bid to create a knowledge economy is the establishment of a homegrown software development industry. The National IT Plan Project has outlined initiatives to establish an IT industry that could evolve into the second or third biggest contributor to the Kingdom's economy. At the heart of the IT plan is the establishment of an independent body to manage, regulate, and implement the plan by coordinating and collaborating with all government agencies, institutions, and the private sector.

Saudi Arabia has long enacted laws protecting Intellectual Property (IP): Trademark Law (1984), Patent Law and Copyright Law (both in 1989); but until recently they were only enforced on printed materials. In recent years and with the increase of global trade in Saudi Arabia, many vendors called for better enforcement of these laws. The first steps taken in this matter were mainly concerned with the audio and video materials. Enforcement of these laws was successful to a great level.

Unfortunately, the enforcement of software copyrights has not been as strong as it should be, resulting in high piracy rate. Although there are no solid figures on this, estimates place it above 75%. Local software developers affected by this practice initiated the movement towards enforcement of software copyrights. Global IT firms establishing their presence in Saudi Arabia have also joined the call for stronger enforcement.

ICT Infrastructure

Saudi Arabia is currently undergoing a complete transformation of its existing telecommunication infrastructure, starting with a \$4.2 billion contract to modernise the infrastructure in 1994. The telecommunication sector continues to grow at a remarkable rate, with the expansion of both facilities and services. The country's telephone system is already one of the world's most modern and efficient, and new microwave links with Arab countries have been opened to strengthen regional communication. Domestic microwave service between smaller towns supplements the 9,300-mile 550-station microwave system.

As of 2000, the country has around 2.6 million phone lines in place, which translates into 13.64 phone lines per 100 inhabitants. This places Saudi Arabia behind many other Arab countries in the region, despite its modern telecommunications infrastructure.

The Kingdom's seven standard earth stations linkup with the Intelsat, ARABSAT and INMARSAT Satellite Systems, allowing subscribers to dial 185 countries directly. These stations are also used for television and radio transmissions. Currently Saudi Arabia has more than 6,000 satellite circuits. The country also has 3,100 miles of coaxial cables. Telex has also seen impressive growth, with the number of lines increasing to 9,800, linking over 152 cities and villages to countries around the world.

Some of the major players in the local Saudi Telecom industry are:

- ARABSAT (a consortium of 21 Arab countries with Saudi Arabia holding the largest stakeholder at 36.66% of paid capital)
- Bin Laden Telecommunications Group
- Saudi Cellular Company

Saudi Arabia has two cellular systems in place at this time; the first is an analogue cellular system. It was introduced in the early 80's with a limited coverage area, but it greatly improved over the years. This system has a capacity of 30,000 lines and is still being used throughout the country.

The second more recent system is the GSM 900, which is based on digital technology and is providing better quality and flexibility. This network has been in operation since January 1996 and by now is the market leader in a market with more than 1.2 million subscribers (see Appendix D, data for 2000).

The country neither provides high-speed services (ISDN, T-1, ADSL) nor digital communications, but under the project referred to as TEP6/GSM such services will be available for subscribers. The program will also include an implementation of the GSM digital cellular network operating in the 900 MHz band.

In 1999, the Internet service became available in the Kingdom, with all the connections routed through a state server (Internet Service Provider), sited at the King Abdul Aziz City for Science and Technology (KACST). KACST is initially a research and technology building centre focusing on the petroleum sector. Today, its research activities cover astronomy, atomic energy, computer and electronics.

Access to the Internet in Saudi Arabia, where foreign publications are strictly controlled and censored, has been delayed by worries about material considered offensive. In order to filter out material considered undesirable, above all pornography, the government has created a funnel through which all international websites have to be channelled. The KACST has installed a system that will prevent users from viewing prohibited websites. The ministry of interior is the ultimate government body that decides on. The system is supposed to be updated daily; as new pornographic sites spring up in cyberspace, their addresses will be logged in Riyadh and duly blocked.

As of 2000, there are 26 local ISPs available with more than 900,000 Internet users in the Kingdom. The growth in the number of Internet users has been overwhelming. This has prompted the Saudi business community to become increasingly aware of the value of electronic commerce. In 1999, there were more than 90 companies that had implemented electronic commerce technology in Saudi Arabia. This figure is expected to grow from year to year. Most of these companies are commercial enterprises. Saudi Arabian Monetary Agency (SAMA) is the only government agency that has implemented electronic commerce. Other government agencies are in early planning stages.

Human Resource Development

Saudi Arabia has a reasonably large pool of young, educated workforce, prompting the government to introduce in the early 1990s the Saudization program to get as many skilled Saudi nationals as possible into large corporations (oil and gas; utility, airline, banks and telecommunications) to replace

the expatriates. There is no apparent shortage of personnel in the Saudi IT labour market, but this is due to there being no significant national IT program to create the demand.

There are two sources of labour supply in Saudi Arabia. One is from the local universities, where college graduates with degrees in information technology related majors form the bulk. Three major universities offer programs in this field. The first of these is King Saud University (KSU) in Riyadh; it offers degrees in Computer Engineering, Computer Science, Information systems and Electrical Engineering. The second is King Abdul Aziz University (KAU) in Jeddah, which offers similar program with specialization in Computer Science, Structural Programming, Program Languages, Database Systems, System Analysis, Operating Systems, Electronic and Communication Engineering and Computer Engineering. The third and probably the most recognized both by the national and international academic community is King Fahd University of Petroleum and Minerals (KFUPM), which is located in Khobar. KFUPM offers similar programs to those offered in KSU and KAU. Private institutions and organizations provide the remainder of the local supply.

The second source of labour is the global market, which has been historically the major source of labour for the country. However, this portion of the labour supply has been shrinking, mainly due to stricter immigration laws and the Saudization program.

Hardware

There are no significant hardware production operations in Saudi Arabia. The country is not considered a leader in the area of hardware manufacturing. This is due to the lack of qualified human resources, technology, the strict regulations and the traditional oil based economy. In the area of computers, most of the existing operations are in the form of assembly lines. Just recently, Microsoft Saudi Arabia has appointed five Saudi Arabian PC system builders as Microsoft direct original equipment manufacturers (OEMs). This appointment is the first of such nature in the region; most importantly, it recognizes the high level of quality of the locally assembled PCs.

The Saudi Cable Company carries out the most significant manufacturing operations that exist today. SCC is a local firm based in Jeddah; the firm has established itself in a strong position of market leadership with a reputation for technical excellence and uncompromising product quality.

Software

Saudi Arabia's software manufacturing operations are far ahead when compared to hardware operations. In recent years and as the use of information technology rapidly increased throughout the Kingdom, the software development industry followed. The first goal of the software industry in the country was aimed at satisfying the local demand. Once this has been achieved, the focus shifted towards the regional demands. Many of the nationals of the regions lack English language skills, and because most applications are developed in English there was a great demand for an Arabic version. Several firms seized this opportunity by providing a solution to this problem.

Today an increasing number of Saudi firms provide a variety of services to the local and regional markets. The first products introduced to the local markets were simple word processing applications that supported Arabic language. As the demand grew, so did competition and innovations. The major

advancement came with the introduction of the Arabic version of Windows, which helped establish a standard platform on which developers can build.

Most of the large players in the market are joint ventures with global firms, such as IBM, Comet Group and AT&T. These large firms are the ones that usually provide total solution services, while smaller, local firms gained ground in the area of software development.

The IT market in Saudi Arabia is concentrated in three major areas; around the cities of Riyadh the capital, Jeddah on the West Coast and Dammam on the East Coast. Riyadh is by far the largest and most important IT incubator in the country. It is also regarded as the business centre of the country; therefore, many of the businesses locate there. Dammam comes in second and Jeddah third.

Progress and Impact

- The telecommunications infrastructure has been modernized and is expected to grow at a high rate, with the expansion of both facilities and services.
- The rapid use of information technology has enabled the software development industry to grow in niche areas: software customisation and in producing Arabic-based applications.

Challenges

The main reasons why Saudi Arabia is behind its neighbouring countries in the area of IT can be attributed to the following factors:

- Insufficient computer literacy .
- Lack of government incentives to attract ICT-related businesses (free-trade zones/subsidies).
- Absence of adequate infrastructure, demand-creation program and institutional support to develop the capabilities and the IT industry i.e. no seed/venture capital, IT grant, and E-government programs to jumpstart the market.
- Poor enforcement of intellectual property and copyright laws.



Which about 133 million people (World Bank 2001), Bangladesh is among the most populous IDB member countries, trailing only to Indonesia and Pakistan. Although there have been sustained efforts to improve economic and demographic prospects, Bangladesh remains one of the world's poorest, most densely populated, and least developed nations.

Almost two-thirds of Bangladeshis are employed in the agriculture sector, even though this sector contributes only about a quarter of the GDP (2001 GDP: US\$46.7 billion). Rice is the single most important product. Many factors impede continuous growth: frequent cyclones and floods, inefficient state-owned enterprises, inadequate port facilities, a rapidly growing labour force that cannot be absorbed by agriculture, delays in exploiting energy resources (natural gas), insufficient power supplies, and slow implementation of economic reforms. The ruling Awami League government has made some headway in improving the climate for foreign investors and liberalizing the capital markets.

Policy and Regulations

The Bangladesh government is committed to pursuing a liberalized, market economy, this constituting a major part of its reform policy. Hundreds of losses making state owned enterprises have been put up for sale. Political opposition and pressure from trade union are hampering this process however, and in recent years, the liberalization program has come to almost a standstill.

The telecommunications sector has been privatised for several years, resulting in infrastructure development, fixed and cellular services to reach even the rural areas. The following are the major telecommunication service providers.

Bengal Telecommunication & Electric Corporation (Pvt.) Ltd (BTTB)

BTTB is the national telecommunications company offering standard telecommunication services as well as Internet connectivity at lower rates than that being offered by independent ISPs. BTTB also acts as the telecommunications regulator.

Telekom Malaysia

Malaysia's national carrier has been investing and collaborating with partners in Bangladesh for several years. It has more than 4.2 million subscribers. The company's operations include TelCo, its core telecommunications business, and Telekom Multimedia, which develop Internet-related new media businesses.

GrameenPhone Limited

GrameenPhone is one of the largest cellular providers, with over 50,000 mobile telephone subscribers as at the end of 1999.

Bangladesh began a stronger policy thrust for IT in 1998, with the Prime Minister declaring Software Export as a strategic thrust sector. The vision is to become "an IT-driven nation comprising knowledge-based society by the year 2006"¹¹. Towards this end, software and data processing houses have benefited greatly from the assistance of the government in the form of low interest rates, duty free imports on hardware needed for business, warehouse facilities, and grants.

The IT Policy was later updated and renamed ICT policy to reflect the convergence of IT with Telecommunications and Internet. It identifies the following objectives:

- Promote and facilitate use of ICT in all sectors of the economy for transparency, good governance and efficiency improvement.
- Develop a large pool of world-class ICT professionals to meet the needs of local and global markets.
- Promote use of ICT by providing special allocations for ICT project implementation in the public sector. Train the decision makers in ICT use and promote ICT culture;
- Provide effective incentives for development of ICT sector to both local and foreign entrepreneurs;
- Develop an efficient ICT infrastructure that provides open access to international and national networks.
- Establish legislative and regulatory framework for ICT issues like IPR, data security and protection, digital signature, e-Commerce, ICT education etc. as well as to ensure quality ICT education provided by different private organizations.
- Set up national databases that are reliable and easily accessible to all the people of the country.
- Set up an ICT organization at the highest level (National Council for IT) to continuously promote and foster ICT Industry.
- Enact Laws and Regulations for uninterrupted growth of ICT, in conformity with World Trade Organization (WTO) stipulations.

Bangladesh is a signatory of the GATT Uruguay Round and World Trade Organization (WTO) agreements, including the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), and is obligated to bring its laws and enforcement efforts into TRIPS compliance. Bangladesh has also been a member of the World Intellectual Property Organization (WIPO) in Geneva since 1985. In the year 2000, Bangladesh enacted the copyright bill to help develop and promote the IT industry.

ICT Infrastructure

As of 1997, there were 3 main telephone lines per 1,000 people (644 in U.S.), with \$634 revenue per line (US\$1,280), costing customers about 4 cents for 3 minutes (9 U.S. cents). As of 1998, as far as

¹¹ IT Policy, Bangladesh

this research could ascertain, Bangladesh did not have Internet access, major backbone network and high-speed services.

Following the formulation of the National Council for IT and ICT policy, however, telecommunication networks in Bangladesh started to be upgraded. Data Networks (LAN, MAN, WAN - Local, Metropolitan, Wide Area Network) are emerging. Digital switches capable of services such as ISDN are being installed all over the country. Various public/private organizations have or are in the process of installing LAN in their branches, scattered throughout the country. When private providers' modern infrastructure becomes fully operational, organizations will be able to interconnect their sites. Various organizations are in need of such interconnectivity because current bandwidth connections are very small. The new infrastructure that is being laid down will enable ISPs to provide high bandwidth connectivity as demand grows.

As with companies in the developing world, many Bangladeshi companies use the Internet for communication and information dissemination, promoting their products and services online. But no monetary transactions take place through the Internet because currently the government does not permit credit card charges to be done over this open network. The technology is there, especially among the ISPs.

Human Resource Development

Bangladesh has a sizable number of educated but unemployed young people. Most of them can read and write in English. Universities in Bangladesh are turning out an increasing number of graduates in computer related subjects every year, although the supply is currently much lower than the number required by businesses and government. In addition, there are also a large number of Bangladeshi students studying overseas in computer related subjects.

The government has undertaken numerous programs to enhance the quality and infrastructure of education institutions. Construction of six new science and technology universities out of a planned twelve has already begun. Sixteen polytechnic institutes, including three for women, are also being set up.

Bangladesh's labour force consists of approximately 50.1 million men and women. 21% of these people work in the services industry. Quite a number of Bangladeshi skilled professionals have been working abroad in Saudi Arabia, UAE and Oman causing Bangladesh to suffer the effects of 'brain drain'.

Hardware

The ICT policy of Bangladesh clearly stresses the promotion of the ICT industry and the adoption of E-Commerce in Bangladesh economy, to increase usage of IT in Government activities, and establishing the legal framework to address issues relating to IT, National Security, Health Care, Social Welfare, Transportation, Tourism, and Environment. However, the targeted IT industry is on the software production sector, not hardware.

Currently there is no large-scale production of computer hardware or peripherals. Some Bangladeshi companies, located on the web, claim to make computers. In reality, they buy the parts from elsewhere, and assemble the homemade computers in Bangladesh. As of 2001, none of the global computer hardware manufacturers such as Intel, HP, Seagate, etc have established formal distribution,

sales offices, or dealers in Bangladesh. Many shops in Bangladesh offer these products; and many more offer clone computers.

Software

In line with the policy thrust of promoting the software sector, a few software companies have been exporting software and data processing services. However, the total volume of such export is negligible and records are not available. Computer Solutions Limited, ANIRBAN, IBCS-Primax, BRAC, NACD and Machine Dialogue, are among the firms/organizations, which have made some exports and about which the Export Promotion Bureau (EPB) could collect some information. Despite their best efforts, EPB is still unable to procure documented evidence of actual exports Bangladesh has made. This is because the Committee says they can understand the reasons for the exporters' unwillingness to divulge such information. While all exporters received government patronage in some form or the other, the government wants to increase the export level of software.

The following is a brief description of the four largest software companies, three of them aggressively exporting their software.

- IBCS-PRIMAX SOFTWARE LIMITED was recognized as an export oriented Software House and governmentally financed at very low interest rate.
- NORTH AMERICAN COMPUTING DYNAMICS was recognized as a 100 % export oriented Data Processing Service House. A bonded warehouse facility was made available and duty-free imports of a substantial number of computers and peripherals were allowed.
- BANGLADESH INFORMATION TECHNOLOGY GROUP LIMITED is a virtual company consisting of 23 IT vendors in Bangladesh. This Company was expected to promote export of Software and Data Processing Services with the help of combined resources available with the share holding companies.
- DOLPHIN COMPUTERS LIMITED is a very large software house in Bangladesh. They have a good infrastructure, which includes high-speed workstations and servers fully equipped with utility software for high volume database software development and text writing. The company undertakes large-scale database software development job, Web/Internet software, and Internet-Intranet solution development.

Financing

The Bangladesh banking sector is made up of nine government owned banks, 20 domestic private banks, 6 financial institutions, and 13 foreign banks. Twelve U.S. banks maintain correspondent relationships in Bangladesh, 2 with full service branches. But like most conventional banks around the world, they do not easily lend money to IT companies, especially the small start-ups.

The stock market proved to be relatively easier for IT entrepreneurs to raise money for business expansion. However, due to the market crash in 1996, it has become difficult to attract investors' money into investing in IT. There is no venture capital industry or market in Bangladesh.

Progress and Impact

• Since the ICT policy was formulated with the thrust in software sector, there has been an improvement in ICT infrastructure and the emergence of a few leading software companies exporting out of Bangladesh.

- Universities are increasing the number of graduates in computer related fields. Many of those working overseas send money back to home, encouraging the younger ones to take up computer-related courses in the hope of earning a good income overseas.
- The demand for computers and peripherals has been growing more recently at 20%, and there are more ISPs being established.

Challenges:

- Lack of ICT professionals and knowledge workers. Even though there are universities producing more ICT graduates, the skill sets of these graduates do not often match the skills required by the industry.
- Although privatisation is a critical part of the economic reform policy, there has not been sufficient progress to attract many foreign investors. Although the government has sold off many state-owned enterprises, in practice these firms are still controlled by the government.
- Getting financial assistance and funding for ICT projects and venture.
- Continuously addressing the issues of poverty and high illiteracy.



Guinea, with a population of about 7.6 million and GDP of US\$2.9 billion in 2001, is one of the 31 Least Developed Member Countries (LDMC) of IDB. Despite possessing major mineral, hydropower, and agricultural resources, this country on the continent of Africa remains a poor underdeveloped nation. Guinea has over 30% of the world's bauxite reserves and is also the world's second largest producer. The mining sector accounted for about 75% of exports in 1999.

The government has made some economic progress from the mid to late 1990's, through improvements in fiscal policy, literacy and the legal framework.

Policy and Regulations

After decades of having the posts and telecommunications services managed by a ministerial department, the government established committee in 1989, whose main objective was to restructure and improve the sector. A Statement of Sector Policy for the Telecommunications Services was formulated in 1991, whose objectives includeD giving telecommunications a dominant role in the country's economy and facilitatING the economic growth and social integration of local communities. The policy also separated the roles of the regulator from the operator, leaving the ministry to be responsible for policy and regulation, while another commercial autonomous entity, Sotelgui, was established in 1992 to undertake the operations of providing services. A presidential decree also enacted the telecommunications law.

Sotelgui was first managed by France Cable, and within two years of operations, 28 phone booths were constructed in the capital, central telephone services were established along with a cable network for 9,000 people. Also, a digital telephone exchange was installed for 3,000 lines in the capital and 500 lines in the rural regions.

The government of Guinea further liberalized the telecommunications by privatising Sotelgui, opening it to international investors. The new company is as of today owned 60% by Telekom Malaysia (TMB) and 40% by the government, making it one of the first PTT in Africa to be owned and controlled by a foreign company. The plan is to reduce, over several years, both the government's and TMB's stakes in Sotelgui to make way for other international investors.

The commitment and support of the Guinean government towards developing telecommunications sectors has made this sector into one of the most liberalized telecommunication industrIES in Africa. Besides Sotelgui, other foreign, private companies have been allowed to operate in the provision of cellular services. Of the 3 cellular service providers, Spacetel-Guinea is 100% foreign-owned, while Telecel-Guinea is owned 90% by Telecel International.

More recently, the government is also trying to improve access to the Internet, so as to provide information both to the Guineans and the outside world. For instance, the Ministry of Information is

currently negotiating a contract with the CIDA's Electronic Commerce World Institute to establish a web site providing government, business and tourist information to the general public.

ICT Infrastructure

Despite the government's liberalization efforts since the 1990s, Guinea's telecommunications infrastructure remains very underdeveloped. According to the ITU, there were about 6 telephones and 3 mobile phones per 1000 people respectively in 2000 (see Appendix D). The same source also estimated that there were about 19,786 telephone lines in Guinea in 1997, 16,206 in 1996 and 10,855 in 1995. The teledensity or percentage of lines was 0.26 in 1997, 0.22 in 1996 and 0.15 in 1995. The number of pay phones also increased to 106 in 1997, from 33 in 1996 and 22 in 1995. The capital and its suburbs were equipped with 3 switching stations and distribution networks. Eleven switching stations and corresponding networks equip the provincial centres. Microwave transmission lines of more than 2000 km connect the provincial centres to Conakry through 3 routes. International Links are provided through the PANAFTEL network with neighbouring countries and an Intelsat satellite with the rest of the world.

As mentioned above, the market for cellular services has also been liberalized. Besides Sotelgui, the other private sector providers are Telecel-Guinea and Spacetel-Guinea, both established in 1994.

Guinea has been connected to the Internet since 1997, when Sotelgui started providing Internet services through a project with the USAID's Leland Initiative (an initiative to improve Africa's global Information Infrastructure). Sotelgui signed two contracts with the USAID. The first was for the installation of the national Internet Gateway in the capital. The objective of the second contract was to provide Internet access outside the capital, to secondary/local cities. This part of the project has already been completed in 3 local regions where the USAID group installed commercial ISPs using the new VSAT satellite technology that delivers high-speed bandwidth to multiple locations at a shared cost. This technology uses both telephone networks and radio transmission lines to connect to the Internet. Thanks to this initiative, the Internet is now accessible not only in the main city but also in rural regions. Future development of this project will aim at connecting more rural cities using the same cheap technology.

According to the African Internet Connection, as of May 1999 Guinea has 5 Internet Service Providers (ISPs), 300 Internet accounts, with 128 kpbs bandwidth. The second ISP in Guinea is ETI-Bull, which offers three kinds of Internet service packages. One of these packages costs 40000 GNF/month (\$40) and consists of 8 hours of connection (with each additional hour costing 5000 GNF) and 1 email account. This is expensive when compared to THE rates in many developing countries. The third Internet Service Provider is BINTA/MiniNet.

In general, Internet in Guinea is still in its very infancy and costs relatively high. As only few select people have credit cards, it has made it very difficult for the government or private sector to utilise e-commerce application.

The adoption of IT in Guinea is mostly concentrated in the capital city Conakry. IT is utilized by different groups in Guinea, namely businesses, private schools, the two universities, international agencies (World Bank, NGOs) and governmental departments. One of the more active IT users among government institutions is the Ministry of Information, which is currently negotiating a contract with the CIDA's Electronic Commerce World Institute to establish a web site providing government, business and tourist information to the general public. Another user is the Ministry of Higher Education and Research,

which operates a point-to-point wireless link between the two universities, which are connected via a dialup to the US.

Human Resource Development

Although the government has put in serious effort in combating illiteracy, the level, at 65% in 1999 (HDR 2001), remains very high. The government's action, through the Ministry of National Education, has helped to increase the rate of schooling to 48% in 1996. The goal is to increase the rate to 53% by 2000 and 100% by 2010. Besides the program to increase schooling, the government has also put into place a program for Guineans who have not been able to go to school.

The illiteracy rate is very high in rural areas where the means are scarce and children spend their time helping to gather food instead of going to school. To solve this problem, the ministry has created a project called "Education on Matters of Population" whose role is to help families in rural communities send their children to school.

The citizens at large are very conscious of the illiteracy problem, and quite often people living in the capital combine resources and send money to villages to build schools. Many rural schools have been built. Thanks to concerned family members living in the capital for sending money to villages to build schools.

Due to the high rate of illiteracy, Guinea faces a shortage of technical skills. The country has only three universities: one in the capital Conakry, and two in rural regions. This lack of resources is a major problem preventing many foreign companies to invest in Guinea. The privatisation and liberalization of the telecommunications market has helped somewhat, especially in the case of Sotelgui, where the new partner Telekom Malaysia is expected to transfer to the country its technological know-how by training and employing local people. The company had to bring Malaysian engineers to train young Guinean workers, or send Guinean engineers abroad for training.

The Institute of Polytechnic of Conakry provides training in telecommunications. The World Bank and GTZ are assisting the institute in its development program. The main university also has an IT centre specialized in providing training in new technologies, and it has access to the Internet. Thanks to UNESCO. The Ministry of Higher Education and Scientific Research is also supporting the university by providing the email link to the Internet, thus connecting the Ministry to the campus. There is a project underway to extend the link to the other two universities.

Besides the University, there are now many quick formation schools in the main cities offering classes on basic computing skills. The two ISPs (BINTTA/MiriNet and ETI-Bull) and Sotelgui also provide training, consulting, and web page creation services.

IT Industry

Guinea does not have any software or ICT equipment manufacturing operations, obviously due to the lack of financial resources and the technical know-how. All hardware equipments have to be exported from abroad, usually at very high prices. This situation has led to the slow pace of ICT infrastructure deployment, as the service providers need to purchase equipment from abroad, which is both time consuming and expensive.

Financing

The government, a few foreign private companies and international organizations such as the World Bank and the USAid are still the primary financiers to the telecommunication industry of Guinea. Sotelgui has benefited with the aid from the government, and capital from its 60% owner Telekom Malaysia. There are very few companies investing in this sector, and there are no special internal funds to accelerate its development.

Progress and Impact:

- The government's liberalization effort has resulted in a significantly improved overall telecommunication system and services.
- The penetration of telephone subscribers has increased many times since market liberalization. For instance, the number of telephone subscribers increased by about 4 times (from 10,000 to 40,000 subscribers) in the first 2 to 3 years since Sotelgui was privatised.
- Guinea's relative political stability, proper regulations and policies have helped make its telecommunications market the most liberalized in Africa, potentially encouraging investors to participate in its economy.
- The government's education program has increased school enrolment, and thus illiteracy, although still very high, has been steadily declining.

Challenges:

- Accelerating the investment in overall education, such as building more schools, training enough teachers, and enforcing primary schooling. Continuously developing human resources, especially in government and businesses, is also a major challenge.
- Continuing investment in IT and telecommunications sector. The government need to think of other ways of attracting investors and raising funds for infrastructure development.
- Even though the telecommunications market is liberalized, the service providers have still a long way to go in providing excellent customer service, training a larger pool of local employees, and developing the organizational and management capabilities to be more efficient, for example, in the fee collection process.



ordan is a small country with a population of about 5 million. In recent years, it has aggressively promoted ICT development to take advantage of its young, educated workforce as well as its strategic geo-political position in the region.

Jordan's national IT development strategy for launching the IT industry and tapping into the growing global market for IT products and services is called REACH. It is a 5-year plan providing a comprehensive framework that embraces actions in the following areas:

- **Regulatory Framework**
- Enabling Environment and Infrastructure
- Advancement of National IT Programs
- Capital and Finance
- Human Resource Development

REACH laid out a clear plan of action to bolster the country's nascent IT sector and to maximize its ability to compete in local, regional, and global markets. It took a critical look at Jordan's strengths and weaknesses vis-à-vis other relevant competitors. Most importantly, it outlined a 5-year plan, specifying actions to be implemented by the private sector, the Jordanian government, and other stakeholders, to ensure a favorable place for Jordan in the next-generation with an Internet-based electronic economy.

The goals and targets outlined in REACH are ambitious but attainable. By 2004, Jordan aims to:

- Generate 30,000 IT/IT-related jobs
- Generate \$550 million per year in software and IT exports
- Attract \$150 million in foreign direct investment.

The benefits of accelerated growth in the IT sector will not be limited to economic gains. The social benefits will include an empowered population, improved public services, and better education for all Jordanians. Strategic benefits include greater efficiency of government, creation of a knowledge-based economy, enhanced economic competitiveness, and less dependence on traditional markets.

Achieving these goals and economic targets requires the sustained implementation of a range of actions in a number of interrelated areas. The REACH strategy organized these actions into six strategic thrusts:

- 1. IT Industry Development.
- 2. Policy and Regulatory Strengthening.
- 3. Human Resource Development.

- 4. Government Support.
- 5. Capital and Financing
- 6. Infrastructure Improvement

Policy and Regulations

The Information and Communication Technology Advisory Council (ICTAC) is a public-private sector committee chaired by the Minister of ICT. This eleven-member Council represents a formal partnership of public and private sector stakeholders with the authority to monitor and guide the implementation of REACH objectives through the government. Housed permanently within the Ministry of ICT, the Council is an institutionalized forum for advocating reforms that enable the growth and development of Jordan's ICT Sector.

Of all the REACH legislations advocated in Jordan, the most critical were those laws and regulations pertaining to ownership of Intellectual Property Rights (IPR). The amendments to the Copyright Law, Patent Law, and Patent Regulations passed in 2001 assure investors that intellectual property rights in Jordan meet the highest international standards.

A new Electronic Transactions Law supporting e-commerce and e-banking was adopted in January 2002. Based on United Nations Commission on International Trade Model Law (UNCITRAL), Jordan's Electronic Transactions Law recognizes the equivalency of electronic signatures, documents, data, and transactions as having the same legal status as original versions. In addition, the law grants the Central Bank of Jordan the authority for regulating the electronic transfer of funds and also sets penalties for any crime committed through electronic means.

Another critical legislative coup was the adoption and implementation of an amended Telecommunications Law. Amendments to the law made possible the dramatic transformation of the Ministry of Post and Communications into the Ministry of Information and Communication Technology (MoICT); with the authority to formulate and implement ICT sector policy. It also transformed the Telecommunications Regulatory Commission (TRC) from a part-time body chaired by the Minister into a five-member full time Commission, separated from Government with full authority to regulate and facilitate competition in the telecommunications industry. As a result of these changes, investor confidence in the ICT sector will grow dramatically.

Membership in the WTO and implementation of a Jordan-US Free Trade Agreement are tangible evidences of Jordan's commitment to trade liberalization. The government of Jordan has also made specific commitments to support international trade in, and IPR protection of ICT products and services. Jordan has already adopted the WTO's Customs Valuation of Carrier Medium Bearing Software and Interest Charges regulation to meet the international standard for customs valuation of IT products. In addition, Jordan is a signatory to the WTO Information Technology Agreement (ITA) that requires the elimination of customs duties on ICT products.

Infrastructure Development

In 1995, the Jordanian Parliament ratified Telecommunications Law No. 13. The law called for the transformation of the former state-owned telecommunications monopoly, TCC, into a governmentowned company called the Jordan Telecommunications Company (JTC) and established the Telecommunications Regulatory Commission (TRC) as the regulatory body in charge of implementing government policy in the sector and arbitrating between different operators. Besides JTC, other major players in the telecommunications sector include Global One (now acquired by JTC) and Batelco.

Jordan still has comparatively low computer and Internet penetration levels, although Internet market has been growing gradually. The country had little more than 9,000 Internet subscribers in 1997, which grew to 50,000 in 2001, a penetration rate of just above 1% (see chart below). The slow uptake of Internet services has been largely due to the relatively high cost of PCs, which explains the popularity of Internet cafes in the country for non-PC owners.



Internet Subscribers in Jordan (Source: Telecom Regulatory Commission and Industry Estimates)

Privatization and partial liberalization of Jordan's telecommunications sector, along with strong lobbying on the part of MOICT and Int@j, have resulted in significant improvements in telecom services and pricing. Jordan Telecom offers ISDN access and 64 KBPS to 2 MBPS leased capacity. State-of-the-art broadband technologies like DSL (Digital Subscriber Lines) and PRI (Primary Rate Interface) are available commercially, as are Frame Relay, fiber and ATM (Asynchronous Transfer Mode). High-speed Internet connectivity ADSL lines are widely available, offering download speeds at 512Kbs and 1,024 Kbs. A dedicated data network, access to a national Internet node, and links to international fiber optic systems such as FLAG (Fiber Optic Link Around the Globe) have all dramatically improved Jordan's Internet and data transmission capabilities.



Fixed and mobile telephone subscription in Jordan

Human Resource Development

Jordan's greatest asset is its competent, educated workforce, and the REACH Initiative is a strategy designed to develop and capitalize on that resource. The number of Jordanians entering the ICT field is already growing dramatically. Demand for technology education has risen over the past year to make IT the 3rd most popular college major in Jordan, up from 10th, a year ago.

In response to H.M. King Abdallah's request to develop an online database for gathering intelligent information about Jordan's ICT skills base, a local IT firm, NETS, created <u>www.it.jo</u>. The site was first developed and launched in coordination with the Ministry of Education and the Jordan Computer Society (JCS).

The Connecting Jordanians Initiative (CJI) is a national campaign introduced by the Ministry of Information and Communication Technology (MOICT) to incorporate ICT into the daily lives of all Jordanians. Currently, the main priority of the CJI is to ensure that access to computers and networks is made readily and effectively available to all learners in Jordan. By extending information and communications technology into learning processes, the government is working to encourage widespread participation in ICT and accelerate adoption of the technology-based skills needed to transform Jordan into an ICT hub for the region.

The Ministry of Education is implementing another initiative to equip all public schools in Jordan with 100,000 computers by 2005. Significant progress has been made. Out of 3,100 primary and secondary schools, 1,650 have already been equipped with computer labs. However, only forty-four of these are currently connected to the Internet. All students in grades 11 and 12 have access to computer labs, and the computer-to-student ratio in these grades is 8 to 1. Each lab has approximately 10 to 20 computers, and the total number of computers in schools is now up to 28,000. Five thousand of these units were PCs recycled through the Ministry's computer refurbishment program.

Guideline for a National IT Strategy

The Ministry of Education developed a comprehensive e-learning strategy with technical assistance from the Canada International Development Agency. To plan, guide, facilitate, and coordinate implementation of this strategy, the Ministry of Education established an E-Learning Coordination Unit in 2001. In addition, computer literacy has been introduced into school curricula from grade 3, a national syllabus for secondary IT education has been adopted, and IT coursework was added to the *tawjihi*, Jordan's national college entrance exam.

Currently, an education portal, www.learning.jo, is under development by the Ministry of Education. Designed to be a comprehensive learning site for all Jordanians, the website will initially host K-12 educational resources. As the Connecting Jordanians network grows, the portal will expand to reach post-secondary and continuing education levels. By 2005, a fully functional learning portal should be accessible to all citizens.

The Ministry of Education is investing \$6.7 million in training its teachers with the skills to integrate technology into the learning process. Programs have been established to train teachers in computer literacy and technology-based teaching techniques. With UNDP assistance, 1,500 teachers have earned their International Computer Driving License in basic computer literacy, and 4,500 more are in the process. In addition, two-week long training workshops called the Summer Institutes, delivered by the Canadian New Brunswick Department of Education, were started in 2002.

To increase public access to information technology, His Majesty King Abdallah II has taken the lead by establishing the Jordan Information Technology Community Centers (JITCC). JITCCs are full-service computer labs hosted within already existing community and youth centers throughout Jordan. JITCCs are strategically located in urban and rural communities, often serving women, children, and people with special needs who might not otherwise have access to technology. Currently, services provided through the JITCCs include walk-in Internet access, ICT support access (computers, printers, faxes, etc.), English language learning software, pilot social development services (leadership training, special needs, etc.), and training in basic computer literacy.

NetCorps Jordan, modeled after a successful Canadian program, is designed by the Ministry of Information and Communication Technology to accelerate the impact of the Connecting Jordanians initiative by tapping into the creativity and energy of the country's youth. Through this program, young Jordanian graduates are provided with the technology and business training needed to promote the applied use of technology in communities around Jordan.

Government Support

With the adoption of Jordan's Telecommunications Law, strong leadership from the Minister, and technical assistance from highly-qualified staff and consultants, the Ministry of Post and Communications has successfully evolved into the Ministry of Information and Communications Technology (MOICT). The MOICT is responsible for articulating policy in the areas of information technology, telecommunications, and postal services. Dubbed the 'e-Ministry,' its expansive role goes beyond policy-making and includes: stimulating local and foreign ICT investment, promoting ICT awareness and development, increasing technology adoption throughout the country, and overseeing Jordan's e-Government Initiative.

The government also long established the National Information Center (NIC), mandated to develop and maintain the National Information System (NIS). The NIC has established a nationwide,

distributed network linking the information centers in both the public and private sector. It formulated the information strategy and policy in 1998 that serves as the guide for the strengthening of both the national infrastructure and the development of the information services industry. It also provides training, research, and runs several community-based IT centers in Jordan.

IT Industry Development

One of the most fruitful achievements of the REACH Initiative was the creation of a dynamic new IT industry association, Int@j. This association is now the focal point for all IT industry-related activities in Jordan. Int@j's professional staff works tirelessly to provide a wide range of high-quality services to members. As a result, membership in Int@j has more than doubled since January 2001, growing from 53 companies to 113.

Int@j's main objectives are to:

- 1. Advocate industry issues.
- 2. Promote industry investment opportunities in Jordan.
- 3. Provide industry research and market information.
- 4. Effect standardization, certification, and quality control in IT.
- 5. Support human resource development.
- 6. Advance industry intellectual property rights.
- 7. Form international IT industry alliances.
- 8. Manage industry stakeholder relations and resolve industry conflicts.

Impressed with Jordan's achievements in developing its ICT sector, Intel established the first Internet laboratory (I-Lab) in the Arab world at Jordan University's King Abdullah II College of Information Technology. The lab, opened in September 2002, is designed to serve as an incubator for Internet and e-business start-ups in Jordan. The lab will test and evaluate new entrepreneurial business models, and assist in their technical realization through the Intel network.

Progress and Impact

The REACH program has made significant progress in developing Jordan's Information and Communications Technology sector. Its achievements make Jordan one of the best candidates for becoming a regional IT leader and internationally recognized exporter of IT products and services. These progresses were reached through the committed and concerted efforts of Jordan's public and private sector stakeholders, working in close partnership with NGOs, academic institutions, and multinational ICT firms.

- Significant growth in the internet and telecommunications market that stimulates the IT industry
- In terms of economic benefits that the program has brought in approximately \$168 million in 2001, generated from IT services, software and hardware. Total domestic revenue was an estimated \$130 million, while export revenue for IT companies reached about \$38 million in 2001 (22% of the total revenue from ICT services).

• The successful adoption and implementation of an amended Telecommunications Law.

Challenges

- Jordan is a small market. Local IT companies need to rapidly acquire the skills for international business and develop quality products if they are to compete for the regional/global market.
- Being small and open, Jordan's IT industry is susceptible to trends in the global market for IT, such as the severe market corrections for Internet-based businesses in the late 2000. As such, the challenge is to diversify capabilities and find new markets in both the domestic and regional areas so as to make the industry and economy more resilient.
- The SME's and new start-ups are finding it very hard to find venture capitalists for support.

APPENDIX B : CENTRES OF EXCELLENCE

B1 – National Information Technology Council (NITC), Malaysia

1. POSTAL ADDRESS: NITC Secretariat

c/o MIMOS Berhad Technology Park Malaysia 57000 Kuala Lumpur MALAYSIA

- **2. TELEPHONE:** +6 03 8996 5000
- **1. FAX:** +6 03 8996 0255/0962
- 2. TELEX:
- 3. URL: <u>www.nitc.org.my</u>
- 4. E-MAIL: <u>secretariat@nitc.org.my</u>
- 5. PARENT INSTITUTION OR BODY: Malaysian Government
- 6. JOINT ORGANIZATION(S): NA
- 7. HEAD OF THE CENTER: YAB Dato' Seri Dr Mahathir Mohamad, Chairman
- 8. DATE OF ESTABLISHMENT: 1994
- 9. TYPE OF THE CENTER: Governmental
- 10. **PROFITABILITY:** Non-profit
- 11. NUMBER OF STAFF: NA
- 12. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: English, Malay
- **13. AIM OF THE CENTER:**
 - promote the sustainable growth of IT development and application via R&D planning and technology acquisition strategies
 - ensure smooth integration of new technologies into social and economic development
 - determine the likely impact of IT on the economy and society
 - explain and promote the potential of IT in transforming societies in all its dimension

14. MAJOR ACTIVITY AREA(S):

- a. Strategic planning and management
 - Articulating the wider implications of IT in development

- Drawing up national plans and turning it into operational programs
- Formulating development programs to enhance national competitiveness
- Identifying national priorities
- Determining the objectives of IT development
- Enabling the restructuring of key organizations and institutions to take advantage of IT

b. Coordination and evaluation

- Monitoring and tracking progress in development programs, including Human Resource Development programs
- Formulating performance indicators and IT standards
- Evaluating the effectiveness of IT use in organizations
- Building the appropriate legal framework for regulation and development for the IT sector
- Providing incentives for accelerated growth
- Measuring the impact of promotional activities

c. Technology assessment and forecasting

- Constructing and disseminating scenarios depicting future trends
- Cultivating the skill to merge a number of technology trends into specific application areas

d. Promotion

- Collecting and directing basic data and information to key users
- Disseminating awareness and appreciation programs
- Mounting focused programs for target groups
- Forging cooperation with public sector, private sector, NGOs and trade unions, media

15. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

• E-Economy

Under this strategic area, all sectors of the Malaysian economy are envisioned to create value and wealth through successful participation in the emerging knowledge-driven global economy. By focusing on a knowledge-driven economy, this strategic thrust area oversees the development of the nation's economy into one that makes optimal usage of IT and the electronic media to foster growth and global competitiveness.

• E-Public Services

E-Public Services gets the Public, Private and Community Sectors to work together in order to provide a people-oriented, customer-focused service electronically. By focusing on the delivery mode, this strategic thrust area facilitates continuous improvement on the electronic delivery of public goods and services in order to meet current and future demands of customers.

• E-Community

E-Community strategic thrust area was charged with facilitating the interests of various communities in order to improve the quality of life. Using electronic means, communities may be able to interact and communicate although they may be geographically dispersed. By focusing on the participatory and inclusive governance processes, this strategic thrust area aims to enhance the quality of life of all Malaysians.

• E-Learning

Learning is the first step towards capitalising on knowledge. This strategic thrust area envisions the creation of formal and informal network, providing the opportunity and cultivating an ethos of life-long learning for individual, organisational, institutional and societal advancement. It is expected that E-learning will be the vehicle to accelerate the pace of growth of Malaysia's intellectual capital.

• E-Sovereignty

Through this thrust area, it is the surest and most constructive manner in which the nation can secure and enhance its sovereignty in the cyberworld. By focusing on building a resilient national identity, it is envisioned that citizens and institutions zero in towards enhancing national identity, integrity and societal stability in the face of borderless challenges to the nation.

• Multimedia Super Corridor (MSC)

Empowered by the vision of the National IT Agenda, the Multimedia Super Corridor (MSC) is seen as a big step in migrating to the values-based knowledge society. In this respect, the MSC is yet another ripple to help in the migration process towards the NITA, as embodied in Vision 2020.

• National ICT Security and Emergency Response Centre (NISER)

NISER aims to address core ICT security issues in the country. Through collaborations with other agencies, NISER will provide specialised ICT security services and continuously identify possible gaps that could be detrimental to National Security. NISER will not nullify the need for dedicated team(s) within an organisation but will further enhance those services provided by aforementioned team(s) through mutual co-operation, information sharing and expert assistance.
• Demonstrator Application Grant Scheme (DAGS) – NITA

Demonstrator Application (DA) can be regarded as a key initiative to the realisation of the NITA. DA is identified as a vehicle for economic transformation during the current economic slowdown. DA helps in improving the total factor productivity in all economic sectors. DA is also a mean for capacity-building medium for the Information and Communication Technology (ICT).

• Mobile Internet Unit – MIU

Mobile Internet Unit (MIU) is a development project on computer-mediated education for teachers and students in schools of Malaysia. It is a self-contained, mobile library cum computing center in the form of a bus, driven by a "smart" driver and co-driver, which goes around the non-main stream schools in the country to conduct basic ICT (Information & Communication Technology) literacy programs. Non-main stream schools are schools that are deprived of access to information and opportunity to acquire ICT skills. These schools are not included in the current government Smart Schools Programs or any other similar ICT initiatives conducted by non-government agencies.

• SJ2005

SJ2005 envisions growing and evolving the Subang Jaya community into a smart and Knowledge-based Community. The project uses a tri-sectoral participation model between the Government sector, private entities and communities, and aims to complete by the year 2005.

• Knowledge Economy

The Knowledge-based K economy research for Malaysia was initiated at the NITC/<u>MIMOS Berhad</u> in October 1998, concurrent with 3 other subject matters, i.e., e-economy, e-commerce and productivity.

• TIGer Project

TIGer stands for Technology+Industry+Government for the E-Economic Revolution of Malaysian businesses. The TIGer initiative aims to roll-out a DAGS showcase nation-wide to ensure the competitiveness of the manufacturing sector of the country for a more "secured" economy. TIGer provides an integrated platform for collaboration between manufacturers with their global and local buyers and suppliers. This strengthens their industry supply chain links and create value add and efficiencies throughout the supply chain. TIGer also promotes the use of local technology for collaboration amongst the industries for a sustainable economy. The first year will see TIGer target the Electrical and Electronics industry and from the second year onwards target other industries.

B2 - Dubai Internet City, UAE

1. **POSTAL ADDRESS:** Shaikh Zayed Road (before the 5th exchange) 73000 Dubai UNITED ARAB EMIRATES

- **2. TELEPHONE:** +971 4 3911111
- **3. FAX:** +971 4 3919000
- 4. TELEX:
- 5. URL: <u>www.dubaiinternetcity.com</u>
- 6. E-MAIL: <u>opportunities@dubaiinternetcity.co.ae</u> /lir@dubaiinternetcity.net
- 7. PARENT INSTITUTION OR BODY: NA
- 8. JOINT ORGANIZATION(S): NA
- 9. HEAD OF THE CENTER: Ahmad Bin Byat, Director General
- 10. DATE OF ESTABLISHMENT: October 2000
- 11. TYPE OF THE CENTER: Private and independent, Affiliated to the Government of Dubai
- 12. **PROFITABILITY:** For-profit
- 13. NUMBER OF STAFF: NA
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: Arabic, English
- **15. AIM OF THE CENTER**: The mission of Dubai Internet City is to create an infrastructure, environment and attitude that will enable Information and Communication Technology (ICT) enterprises to operate locally, regionally and globally, from Dubai, with significant competitive advantage.
- 16. MAJOR ACTIVITY AREA(S): Provides a Knowledge Economy Ecosystem designed to support the business development of Information and Communication Technology (ICT) companies. Provides services to IT and telecommunications companies, multimedia businesses, Internet start-ups, remote services providers, venture capitalists and incubators.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

1. Dubai e-government

• Website: <u>http://portal.dubai-e.gov.ae/http://portal.dubai-e.gov.ae/ http://web-vgn.dubai-e.gov.ae/8083/egovd/cda/main/Home_Page</u>

2. Dubai Media City

- Website: <u>http://www.dubaimediacity.com/main/home.asp</u>
- Dubai Media City is rapidly emerging as a global media hub. The City provides an advanced infrastructure and supportive environment for media-related businesses to operate globally out of Dubai. Dubai Media City is the place where every kind of media business, specifically Broadcasting, Publishing, Advertising, Public Relations, Research, Music, New Media and Production and Post Production will thrive.
- The City is already home to over 550 media companies including global giants such as CNN, Reuters, Sony Broadcast & Professional, McGraw Hill Publishing, Bertelsmann, and MBC, along with regional companies and new start-ups.

3. Knowledge Village

- Website: <u>http://www.kv.ae/</u>
- A vibrant, connected learning community to develop the region's talent pool and accelerate its move to the knowledge economy
- Positions the Dubai Technology, E-Commerce and Media Free Zone as a centre of excellence for learning and innovation.

B3 - Grameen Phone, Bangladesh

- 1. POSTAL ADDRES: GrameenPhone Head Office Celebration Point Plot No.3&5, Rd No.113/A Gulshan-2, Dhaka-1212 BANGLADESH
- **2. TELEPHONE:** 880-2-9882990
- **3. FAX:** 880-2-9882970
- 4. TELEX:
- 5. URL: <u>www.grameenphone.com</u>
- 6. E-MAIL: <u>info@grameenphone.com</u>

7. PARENT INSTITUTION OR BODY

- a. Name: Grameen Bank
- b. Postal address: Mirpur Two, Dhaka 1216
- c. Telephone No.: (880)2-803-559
- d. Fax No.: (880)2-806-319
- e. Telex No.
- f. URL: <u>www.grameen-info.org</u>
- g. E-mail: grameen.bank@grameen.net

8. JOINT ORGANIZATION(S)

- a. Name: Grameen Telecom
- Postal address: Mirpur Two Dhaka 1216 Bangladesh
- c. Telephone No.: 880-2-801-2330
- d. Fax No.: 880-2-801-3559
- e. Telex No.
- f. URL: http://www.grameen-info.org/grameen/gtelecom/
- g. E-mail: gtelecom@grameen.net

- 9. HEAD OF THE CENTER:
- 10. DATE OF ESTABLISHMENT: 26 March 1997
- 11. TYPE OF THE CENTER: Private
- **12. PROFITABILITY:**
- 13. NUMBER OF STAFF: NA
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES
- **15. AIM OF THE CENTER:** GrameenPhone (GP) has been established to provide high-quality GSM cellular service at affordable prices. GrameenPhone has a dual purpose: to receive an economic return on its investment and to contribute to the economic development of Bangladesh where telecommunications can play a critical role.
- **16. MAJOR ACTIVITY AREA(S):** GrameenPhone's basic strategy is coverage of both urban and rural areas. The Company has devised its strategies so that it earns healthy returns for its shareholders and at the same time, contributes to genuine development of the country. In short, it pursues a dual strategy of good business and good development.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

18. Village Phone Program

The Village Phone program is GrameenPhone's unique method of bringing connectivity to the rural areas of Bangladesh. This program enables Grameen Bank's borrowers to retail telephone service in their respective villages, and has the potential to penetrate the rural areas rapidly and effectively. The Bank operates in 39,172 villages through 1,138 branches and 12,801 workers and its effectiveness is established through a recovery rate of 96% from a borrower base of 2.3 million.

A typical Grameen Bank borrower takes a loan of \$100 without collateral from the Bank to purchase, say, a cow. The cow would then produce milk that the borrower could sell to his neighbours enabling him to make a living and pay off the loan. The process allows the poorest of the poor to stand up on their feet. In the case of Village Phone, a telephone also acts as an income generating mechanism for a borrower; a telephone serves as another "cow." A man borrows about \$350 from the Bank, purchases a handset and sells telephone services to the villagers, making a living and thus paying off his loan. It creates a self-employment opportunity in each village and provides access to telephones to all.

A pilot program involving around 300 villages has confirmed that the Village Phone concept is economically viable. Each of the Village Phone operators is making \$2 per day on average, or \$700 per year, after covering all his costs. This earning of more than twice the country's annual per capita income is a proof that phones are being put to good use in these villages. Soon hundreds of villages are expected to have the same facilities.

Grameen Telecom, Grameen Bank's arm for administering the Village Phone operators, typically selects women by considering past borrowing records with the Bank. There are more than 20,000

Village Phones in operation today and soon thousands of Village Phones around the country are expected across rural Bangladesh.

(source: www.telecommons.com/villagephone/contents.html)

19. PUBLICATIONS: Grameen Phone Monthly Newsletter

B4 - Information and Decision Support Centre (IDSC), Egypt

1. POSTAL ADDRESS: 1 Maglesss Al-Shaab Street Cairo EGYPT

- **2. TELEPHONE:** +2 02 7929292
- **3. FAX:** +2 02 7929222
- 4. TELEX:
- 5. URL: <u>www.idsc.gov.eg</u>
- 6. E-MAIL: <u>info@idsc.gov.eg</u>
- 7. PARENT INSTITUTION OR BODY: NA
- 8. JOINT ORGANIZATION(S): NA
- 9. HEAD OF THE CENTER: Eng. Raafat Radwan, Chairman
- 10. DATE OF ESTABLISHMENT: 1985
- 11. TYPE OF THE CENTER: Governmental
- 12. **PROFITABILITY:** Non-profit
- **13. NUMBER OF STAFF: NA**
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: NA

15. AIM OF THE CENTER:

- Build a national decision support system.
- Capacity building for governmental decision makers in the area of IT.
- Enhance networking among government agencies, civil society, non-governmental institutions and private sector.
- Build an institutional crisis management system.
- Develop capacities of the Information Technology Institute.
- Build and develop the National GIS Center.
- Increase Egyptian international digital activity.

16. MAJOR ACTIVITY AREA(S):

The Information and Decision Support Center (IDSC) was initiated to support the Egyptian Cabinet's decision-making process in socio-economic development. It also acts as a catalyst for building Egypt's information infrastructure. Ever since its initiation in 1985, IDSC has been working on the process of building up Egypt's Information Technology (IT) industry and decision support infrastructure, in addition to developing a base for the nation's software and hitech industries. IDSC evolved around Egypt's dedicated efforts to join the international IT revolution, and institutionalising the decision-making process through accessing information. IDSC was also established with the long-term vision of providing public access to information particularly business people and investors.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

• Building the Information Services Industry

IDSC adopted a catalyst role towards strengthening the position of Egypt in the global and regional Information Technology map. Facilitating the transfer of knowledge and experience in the field of information technology and software engineering is the first step towards building the nation's information services industry.

• Technology Development Projects

The Technology Development Program acts as a facilitator, coordinator, and catalyst for the establishment of a powerful up-to-date IT industry in Egypt. It has been spreading hi-tech awareness and mobilizing the national capabilities towards developing hi-tech industries. In addition, it works on establishing links with national and international enterprises operating in that field. This trend is expected to encourage the business community develop its capacities towards more contribution to the Egyptian economy.

• Preserving The Cultural Heritage: Cultureware

Cultureware is established to help revive and preserve the cultural heritage of Egypt through the implementation of comprehensive registration and documentation projects, utilizing the features and capabilities of multimedia technology. As denoted from the name, Cultureware integrates science, art and technology with culture to develop integrated information systems and cultural products for the purpose of preservation and dissemination of cultural knowledge.

• High-tech Development for the Disabled

The Egyptian Government believes that physically and mentally disabled have equal rights in contributing to building the Egyptian society and in securing an income that guarantees a respectable standard of living. IDSC with its specialized programs and hi-tech facilities focuses on addressing the problems of the disabled in Egypt.

Current Projects:

• Ministries Program

Obtain accurate updated data from different ministries, agencies and other entities to respond to information needs of executive management level working in the government, private sector, and research centers. The sector also uses the available information to cooperate in generating information publications different programs of IDSC.

• National ID Number For Real Estate

Building a comprehensive National Database that compiles and registers all real-estate treasures in Egypt. This Database should provide complete and unified information and indicators on real estate treasure.

• Strengthening Investment Production

Participating in placing a comprehensive strategy to rise with the economic sector as well as creating a good environment for investment and Decision Support. This is done by providing accurate and recent data and information on the economic activities in Egypt.

• Governorates Program

Implementing Information Technology to support Ministries & Governorates in decision-making and contribute to push forward the sustainable development efforts on all local administrative levels.

18. PUBLICATIONS:

- Monthly Bulletin on Egyptian Export Products
- Library Bulletin
- Global Markets Trends Bulletin
- Egyptian Economic Bulletin (EEB)
- Describing Egypt By Numbers (Yearly Book), etc.

B5 – King Abdulaziz City for Science & Technology(KACST), Saudi Arabia

- 1. **POSTAL ADDRESS :** KACST Prince Abdullah Bin Abdulaziz Road Post Box No. 6086 Riyadh 11442 SAUDI ARABIA
- 2. TELEPHONE: Personnel Department: + 966 (1) 481-3406
- **3. FAX:** +966 (1) 488-3756
- 4. TELEX:
- 5. URL: <u>www.kacst.edu.sa</u>
- 6. E-MAIL: KACST Website: <u>webmaster@kacst.edu.sa</u>

GDRGP Publication Request: <u>gdrgp@kacst.edu.sa</u> Patent Department: <u>patent@kacst.edu.sa</u> Energy Institute: eri-info@kacst.ed.sa

- 7. PARENT INSTITUTION OR BODY
- 8. JOINT ORGANIZATION(S)
- 9. HEAD OF THE CENTER: Prime Minister, Chairman
- 10. DATE OF ESTABLISHMENT: 1977
- 11. TYPE OF THE CENTER: Independent organization of the Saudi Arabian government
- 12. **PROFITABILITY:** Non-profit
- **13. NUMBER OF STAFF:** NA
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: Arabic, English
- **15. AIM OF THE CENTER:**

Vision: To be a world-class research organization vital to Saudi Arabia's future and an important source of S&T for national societal mission which combines technology with human touch. Its objectives are:

- 1. Propose a national policy for the advancement of science and technology and lay down the required strategy to achieve this end.
- 2. Execute scientific research programs for development in the Kingdom.

- 3. Foster private sector to develop agricultural and industrial research.
- 4. Enhance various research programs between the Kingdom and international scientific institutions for the purpose of keeping abreast with scientific advances through scholarships or joint research.
- 5. Offer scholarships and training courses in the field of scientific research. Also award scholarships to individuals and establishments to conduct applied scientific research.
- 6. Coordinate with governmental organs, scientific institutions and research centres in the Kingdom for the purpose of research and data exchange.

16. MAJOR ACTIVITY AREA(S):

From its inception in 1977, KACST has been carrying out its mission in the promotion of science & technology in the Kingdom by coordinating and cooperating with various universities, agencies and institutions concerned with research and technology. It encourages Saudi experts to undertake research that will help promote the development and evolution of the society. Besides, KACST also encourages closer ties with friendly countries through cooperative agreements with international science and technology institutions/organizations. The cooperative research programs have successfully completed several solar energy research projects, establishment of a Saudi Center for Remote Sensing, a national observatory and aquaculture research station and other projects. Among the national research institute of Energy Research, Institute of Natural Resources and Environmental Research, Institute of Arid Lands Research, Institute of Astronomy, Institute of Atomic Energy Research, etc.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

Completed Projects:

- Solar Thermal Water Desalination Plant at Yanbu.
- Solar Thermal Dishes (2 X 50 kW).
- Solar Energy for Dates Drying at Al-Hasa.
- The 3 kW Photovoltaic System: Testing under varying atmospheric conditions in Riyadh area.
- Solar Energy for Rural Electrification: The 350 kW Solar Village Project Soleras.
- The 6 kW Photovoltaic-Grid Connection System.
- Solar Electricity Studies: Lighting, Warning and Traffic Signals (40 kW).
- A Study of Photovoltaic Lighting in Tunnels, (Abha, 110 kW).
- Solar Hydrogen Utilization: Combustion, Engines, Lighting, Cooking and Cooling.
- A Study of Solar Counters and Speed Meters in Cars (10 kW).
- A Study on Solar Telecommunication with 400 kW.

- A Study on Solar Cathodic Protection: (Oil Pipes, 75kW).
- Feasibility Study on Solar Cell Manufacturing in Saudi Arabia.
- A Technical Study on Photovoltaic Lighting in Remote Schools.
- A Technical Study on Solar Water Heating Systems and PV Lighting for Local Mosques.
- A Technical Study on Solar Energy Applications in Remote Buildings.

Current Projects:

- Thermal Performance in Buildings and its Role on Energy Conservation.
- Synchronization and Energy Quality Control in Electric Utility.
- Energy Generation Improvement at Power Stations.
- Electrical Loads Management at Consumer-Side.
- Energy Storage for Energy Management.
- A Study on Solar Collectors Manufacturing in Saudi Arabia.
- A Study on Solar Dryers for Dates and Others.
- Performance of Solar Hot-Water Systems at KACST's Housing Compound

18. PUBLICATIONS: Refer to <u>www.kacst.edu.sa</u>

B6 – Multimedia Development Corporation, Malaysia

- 1. POSTAL ADDRESS: MSC Headquarters 2360 Persiaran APEC 63000 Cyberjaya Selangor MALAYSIA
- **2. TELEPHONE:** +6 03 8315 3000
- **3. FAX No.:** +6 03 8318 8520
- 4. TELEX No.
- 5. URL: <u>www.mdc.com.my</u>
- 6. E-MAIL: <u>info@mdc.com.my</u>
- 7. **PARENT INSTITUTION OR BODY:** Malaysian Government
- 8. JOINT ORGANIZATION(S)
- 9. HEAD OF THE CENTER: Datuk Dr. Mohamed Arif Nun, Chief Executive Officer
- 10. DATE OF ESTABLISHMENT: 1996
- 11. TYPE OF THE CENTER: Government-owned corporation, Incorporated under the Companies Act of Malaysia
- 12. PROFITABILITY: NA
- **13.** NUMBER OF STAFF: <u>+</u> 186(excluding staff in subsidiaries)
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: English
- **15. AIM OF THE CENTER:** The MDC is dedicated to ensuring that MSC is the world's best environment to harness the full potential of multimedia. It is also committed to proactively collaborate with governments and companies for mutual enrichment via:
 - Continuously reviewing the Bill of Guarantees and ensuring its implementation in both spirit and letter.
 - Actively assisting government to pioneer, develop and update Cyberlaws, formulate policy and modify practices to provide a sound framework for the MSC.
 - Ensuring that Open Multimedia Network provides the required bandwidth and quality at globally competitive tariffs with cost-effective interconnection for Value-Added Services.

• Ensuring timely development of top quality physical infrastructure to provide a balanced living and working environment.

16. MAJOR ACTIVITY AREA(S):

- Attracting world class companies
- Facilitating knowledge transfer and wealth creation
- Building a well-mandated, value-based and highly effective institution

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

• Electronic Government

The Government of Malaysia has launched the Electronic Government initiative to reinvent itself to lead the country into the Information Age. Electronic Government will improve both the performance of the government and the quality of service it provides to the people of Malaysia. It seeks to improve the convenience, accessibility and quality of interactions with citizens and businesses; simultaneously, it will improve information flows and processes within government to improve the speed and quality of policy development, coordination and enforcement. In addition, Electronic Government will play an essential role in catalyzing the development of the MSC, as well as furthering political and economic development goals in Vision 2020.

• National Multi Purpose Card

Under this scheme, the idea is to develop a single and common platform for a Multi-Purpose Card (MPC) that will enable the government and private application providers to implement smart card solutions without duplications of effort and investment. Initially, 2 cards will be used i.e. the **Government Multi-Purpose Card** (GMPC) and **Payment Multi-Purpose Card** (PMPC) and eventually merging into a single multipurpose card.

• Smart Schools

The Malaysian Smart School application is the government's initiative to enhance learning institutions through a 'Teaching-Learning' process of curriculum, pedagogy, assessment and teaching-learning materials. The process will enable students to practise self-accessed and self-directed learning that focuses on individual achievements and mind development.

• TeleHealth

This initiative aims to keep Malaysians in the "wellness" paradigm. This process focuses on empowering the individual to greater access and increased knowledge in healthcare for personal health management. The integrated information increases the quality and speed along the healthcare chain.

R&D Clusters

The R&D Cluster is one of the seven Flagship Applications to spearhead the development of the MSC. As an Environmental Flagship, its emphasis is to create a conducive environment for R&D activities. The R&D Cluster is driven by the vision for MSC to develop a web of world-class corporate multimedia centers and universities collaborating to develop leading-edge multimedia products and technologies by leveraging on the excellent infrastructure provided by the MSC.

• E-Business

The E-Business cluster, driven by the objectives of the MSC, aims to shape a competitive Electronic Business environment. This cluster has an enormous potential market that could be one of the driving forces for future economic growth.

Start-up Programme:

• Funding

The Technopreneur Development Flagship recognises that funding is a critical ingredient to facilitate the growth of start-up companies. As such, the Flagship works with relevant funding organisations and business angles to ensure sufficient channels, variety and allocation of seed capital for incubatees of the National Incubator Network. The Flagship also ensures sufficient funding sources for venture capital, grants and working capital loans to meet the needs of the ICT/Multimedia and other strategic high-tech industries. Furthermore, the Flagship periodically organises regional platforms such as the MSC Techventures Forum to increase the exposure of technopreneurs to venture capitalists and investors.

• National Incubator Network

The objective of the National Incubator Network (NIN) is to promote the setting-up of sustainable incubators nationwide, which will act as the spawning ground for start-ups. Built within the NIN is the knowledge-based Centre of Expertise which helps in developing best practice incubation models, programs and talent to mentor and nurture successful start-ups, such as mentoring programs, business advisory and business plan enrichment services.

• World-class Program

The World-class Program under the MDC ACCESS team aims to help Malaysian companies expand into the global market. MDC ACCESS facilitates market expansion by channeling business opportunities to Malaysian companies and facilitating partnerships between local and foreign companies.

18. PUBLICATIONS: msc.com, apitt.com



1. POSTAL ADDRESS: Block D, Pakistan Secretariat, Islamabad PAKISTAN

- **2. TELEPHONE:** (92-51) 920-5835
- **3. FAX:**
- 4. TELEX:
- 5. URL: <u>www.education.gov.pk</u>
- 6. E-MAIL
- 7. PARENT INSTITUTION OR BODY: NA
- 8. JOINT ORGANIZATION(S): NA
- 9. HEAD OF THE CENTER: Prof. Dr. Atta-Ur-Rahman, Minister for Education, Ministry of Education, Government of Pakistan
- **10. DATE OF ESTABLISHMENT**
- 11. TYPE OF THE CENTER: Governmental
- 12. **PROFITABILITY:** Non-profit
- 13. NUMBER OF STAFF: NA
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: NA

15. AIM OF THE CENTER:

Vision of the Ministry of Education: Education as a categorical imperative for individual, social and national development. To this end, a sector-wide education reform is required to:

- Enable each individual to reach his/her maximum human potential.
- Produce responsible, enlightened citizens.
- Integrate Pakistan into the global framework of human-centred economic development.

16. MAJOR ACTIVITY AREA(S):

• AIMS AND OBJECTIVES OF EDUCATION AND ISLAMIC EDUCATION

Education and training should enable the citizens of Pakistan to lead their lives according to the teachings of Islam as laid down in the Qur'an and Sunnah and to educate and train them as a true practising Muslim. To evolve an integrated system of national education by bringing Deeni Madaris and modern schools closer to each stream in curriculum and the contents of education. Nazira Qur'an will be introduced as a compulsory component from grade I-VIII while at secondary level translation of the selected verses from the Holy Qur'an will be offered.

• LITERACY AND NON-FORMAL EDUCATION

Eradication of illiteracy by extending basic education to the community through formal and informal means. The current literacy rate of about 39% will be raised to 55% during the first five years of the policy and 70% by the year 2010.

• ELEMENTARY EDUCATION

About 90% of the children in the age group (5-9) will be enrolled in schools by year 2002-03. Gross enrolment ratio at primary level will be increased to 105% by year 2010 and Compulsory Primary Education Act will be promulgated and enforced in a phased manner. Full utilization of existing capacity at the basic level has been ensured by having two shifts in the existing schools of basics education. Quality of primary education will be improved through revising curricula, imparting in-service training to the teachers, raising entry qualifications for teachers from matric to intermediate, revising teacher training curricula, improving management and supervision system and reforming the existing examination and assessment system.

• SECONDARY EDUCATION

One model secondary school will be set up at each district level. A definite vocation or a career will be introduced at secondary level. It would be ensured that all boys and girls, desirous of getting secondary education, are enrolled in secondary schools. Curriculum for secondary and higher secondary will be revised and multiple textbooks will be introduced. The participation rate will be increased from 31% to 48% by 2002-03. The base for technical and vocational education shall be broadened through introduction of a stream of Matric (Technical) on pilot basis and establishment of vocational high schools. Multiple textbooks shall be introduced at secondary school level.

• TEACHER EDUCATION

To increase effectiveness of the system, in-service training of teachers, teacher trainers and educational administrators will be institutionalized through school clustering and other techniques. To upgrade the quality of pre-service teacher training programs, parallel programs will be introduced of longer duration at post-secondary and post-degree levels i.e. programs of FA/FSc education and BA/BSc education. The contents and

methodology parts of teacher education curricula will be revised. Both formal and nonformal means shall be used to provide increased opportunities of in-service training to the working teachers, at least once in five years.

• TECHNICAL AND VOCATIONAL EDUCATION

To develop opportunities for technical and vocational education in the country for producing trained manpower, commensurate with the needs of industry and economic development goals. To improve the quality of technical education so as to enhance the chances of employment of Technical and Vocational Education (TVE) graduates by moving from a static, supply-based system to a demand-driven system. Revision and updating of curricula shall be made a continuing activity to keep pace with changing needs of the job market and for accommodating the new developments. Development of technical competence, communication skills, safety and health measures and entrepreneurial skills etc. shall be reflected in the curricula. Institution-industry linkages shall be strengthened to enhance the relevance of training to the requirements of the job market.

• HIGHER EDUCATION

Access to higher education shall be expanded to at least 5% of the age group 17-23 by the year 2010. Merit shall be the only criterion for entry into higher education. Access to higher education, therefore, shall be based on entrance tests. Reputed degree colleges shall be given autonomy and degree awarding status. Degree colleges shall have the option to affiliate with any recognized Pakistani university or degree awarding institution for examination and award of degrees. To attract highly talented qualified teachers, the university staff shall be paid at higher rates than usual grades. Local M.Phil. and PhD programs shall be launched and laboratory and library facilities shall be strengthened. Split PhD programs shall be launched in collaboration with reputed foreign universities and at the minimum, 100 scholars shall be annually trained under this arrangement. All quota/reserved seats shall be eliminated. Students from backward areas, who clear entry tests, shall compete amongst themselves. In order to eliminate violence, all political activities on the campus shall be banned.

• INFORMATION TECHNOLOGY

Computers shall be introduced in secondary schools in a phased manner. School curricula shall be revised to include recent developments in information technology, such as software development, the Information Super Highway designing Web Pages, etc.

• LIBRARY AND DOCUMENTATION SERVICES

School, college and university libraries shall be equipped with the latest reading materials/services. Internet connection with computer shall be given to each library. Mobile library services for semi-urban and remote rural areas shall be introduced.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

• NEMIS

Phase I:

NEMIS (National Education Management Information System) Project Phase I was completed between 1991-93. It was sponsored by UNDP. Phase II was called FedEMIS Project and implemented by AEPAM 1994-98. The main objectives of the project phase I were to:

- 1. Establish the infrastructure for EMIS
- 2. Develop the mechanism for collecting educational data/statistics.

This project was spread over 7 focal points (Islamabad, Karachi, Lahore, Peshawar, Quetta, Muzaffarabad) and it covered most districts and regions in each province. The databases developed included: 1991-96. Reports on Pakistan Education Statistics (1992-93 to 1997-98) were published. School Census of federal Areas (1993-94 to 1996-97) was also completed.

Phase II:

NEMIS is a three-year project sponsored by SAP-II to the tune of Rs. 18.5 million. It was planned to commence from July 1998 but was delayed by a year. NEMIS is a continuation of Fed EMIS or Federal EMIS project (1996-98) which aimed at capacity building of Provincial EMISs in the country. Now that Provincial EMISs have become operational and self-sustaining, the scope of NEMIS has also changed and it mainly revolves around the following four aspects of basic education policy in the country:

- 1. To increase access to basic education, particularly for female students;
- 2. To improve the quality of education by increasing learning achievements and completion rates in basic education;
- 3. To strengthen institutional capacity to plan, manage and supervise education programs;
- 4. To improve community participation in basic education

18. PUBLICATIONS: Refer to <u>www.education.gov.pk</u>

B8 - Ministry of Science and Technology, Pakistan

1. POSTAL ADDRESS: Pakistan Secretariat Block 'D' 44000 Islamabad PAKISTAN

- **2. TELEPHONE:** +92 51 9206536
- **3. FAX:** +92 51 9201815
- 4. **TELEX:** +92 51 5538 NIE PK
- 5. URL: <u>www.most.gov.pk</u>
- 6. E-MAIL: <u>info@most.gov.pk</u>
- 7. PARENT INSTITUTION OR BODY: NA
- 8. JOINT ORGANIZATION(S): NA
- **9. HEAD OF THE CENTER:** Prof. Dr. Atta-Ur-Rahman, Federal Minister for Science & Technology
- 10. DATE OF ESTABLISHMENT
- 11. TYPE OF THE CENTER: Governmental
- 12. **PROFITABILITY:** Non-profit
- 13. NUMBER OF STAFF: NA
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: NA
- **15. AIMS OF THE CENTER:**
 - Prepare and implement S&TR Policies and Plans.
 - Promote S&TR for achieving rapid economic development enhancing self-reliance through the S&TR inputs.
 - Develop and maintain an adequate national science and technology system.
 - Improve the living standard of masses ensuring the national security through S&TR applications.
 - Prepare an overall integrated plan as well as formulation of policy for the development and improvement of information technology including infrastructure.
 - Develop human resource in the field of information technology.

- Promote IT applications.
- Provide guidelines for the standardization of software and electronic governance within the Government.
- Undertake planning, policy making and legislation covering all aspects of telecommunications excluding radio and television.
- **16.** MAJOR ACTIVITY AREA(S): There are 2 divisions of MOST:

a) Information Technology & Telecommunication Division (IT & T)

The Information Technology & Telecom Division was created by the Cabinet Decision vide their O.M. No.4-19/99-Min.1 dated 11th March 2000 in the Ministry of Science & Technology. The national focal point for information technology (IT) which was previously either missing or diffused was rectified with the creation of a new Information Technology and Telecommunications Division under which all telecom and IT related organizations have been placed.

b) Science & Technology Research Division (S & TR)

Ministry of Science & Technology (MoST) is the national focal Ministry and enabling arm of the Government of Pakistan for planning, coordinating and directing efforts to initiate and launch scientific and technological programs and projects aimed at economic development of the country. The Ministry of S&TR is working on the national agenda to have a sound and sustainable S&TR base which would lead to the socioeconomic development of the country and to achieve the vision for a better Pakistan.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

• Human Resource Development

HR Development is the most important area of IT Policy and Action Plan and that is where two-thirds of Ministry's resources are planned to be invested. Rs.1.5 billion have been disbursed to public sector universities.

• IT Industry Development and Promotion

The Government of Pakistan is aware of the fact that the country is lagging in the international IT race and is, therefore, implementing a well thought-out and structured strategy to bring Pakistan onto the digital map of the world. In this regard, Pakistan has broken new ground and changed many established paradigms to get to where it is in this short time. Pakistan has also established a target of achieving US\$ 1 billion in Software Exports by the year 2005 so that the efforts remain goal-oriented and achievable.

• Infrastructure Development

Infrastructure for IT industry is another important area and due attention is being accorded for its development. Fortunately, PTCL and private sector operators have implemented development plans in the past decade, so the improvements required are mostly in terms of structural adjustments, add-ons and not greenfield projects with long gestation times. The structural improvements brought about under the IT Policy and Action Plans have all shown positive results on the growth of IT industry.

• E-Government Initiative

The E-Government initiative has been undertaken by the Government of Pakistan to improve efficiency, quality and transparency in functioning of the Government and also serve as training ground for the thousands of IT professionals being trained in the country. Implementation of these projects would also provide an opportunity for local IT companies to gain experience in domestic projects before they are able to vie for projects in the export markets.

• E-Commerce Initiative

The developed world is moving towards a paperless economy and for countries like Pakistan to be able to participate in the global economy, it is imperative to develop an electronic commerce infrastructure so that business can be conducted via electronic means.

• Telecommunication Development

A strong Telecommunication network will form the backbone of the IT infrastructure. For this purpose, the IT & Telecom Division launched multi-faceted Telecommunication initiative. PTCL has a network of about 4.080 million telephone lines, 3.340 million working connections and 2701 Telephone Exchanges over the length and breadth of the country. 100% digitization would be achieved by June 2002. The Value Added Services like Calling Line Identification, free phones service-0800, Universal Access Number and information based premium rate services have been introduced. Over 650,000 customers are availing CLI facility. PTCL also provides ISDN, PRA and BRA services, DXX and leased lines, Public Call Offices & PCCS, Directory Information services and GSM Mobile telephony through U-Fone (PTML). There are 125,000 U-Fone customers.

• Citizen Online

In order to enable convenient citizen and public sector interaction, internet is a key medium for E-Government initiatives around the world. The "Pakistan.Gov" project focuses on a similar initiative. This is the face of the government to the world. Quality and value of information to the citizens and visitors to web sites will determine the value of this web portal.

• Salary through ATMs

Under this project 18 ATMs are being installed at 13 locations in Islamabad/Rawalpindi for facilitation of payment of salaries to federal government employees. The locations selected are near government offices and residential localities where there is a concentration of low and middle income government employees. The project will become operational in June/July, 2002. Under this project, a 24-hour, seven days-a-week banking facility will be provided to government employees. It will also benefit the banking sector as the employees, under the new facility, will draw only required amount of cash each day and therefore more money will be retained at the banks. The present project is expected to induce more banks to follow suit and target the low and middle income government employees who have been neglected till now.

B9 – SESRTCIC, Turkey

- 1. POSTAL ADDRESS: Attar Sokak, No:4, Gaziosmanpasa, Ankara 06700 TURKEY
- **2. TELEPHONE:** +90 312 468 61 72
- **3. FAX:** +90 312 467 34 58
- 4. TELEX:
- 5. URL: <u>www.sesrtcic.org</u>
- 6. E-MAIL: <u>oicankara@sesrtcic.org</u>
- 7. PARENT INSTITUTION OR BODY: Organization of the Islamic Conference (OIC)
- 8. JOINT ORGANIZATION(S): NA
- 9. HEAD OF THE CENTER: NA
- **10. DATE OF ESTABLISHMENT:** 1 June 1978
- 11. TYPE OF THE CENTER :

Subsidiary organ of the Organisation of the Islamic Conference (OIC) in pursuance of Resolution No. 2/8-E adopted by the Eighth Islamic Conference of Foreign Ministers (ICFM), held in Tripoli in May 1977.

- 12. **PROFITABILITY:** Non-profit
- 13. NUMBER OF STAFF: NA

14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: NA

15. AIM OF THE CENTER:

The basic mandate drawn up for SESRTCIC is three-fold:

- i. To collate, process and disseminate socio-economic statistics and information on and for the utilisation of member countries,
- ii. To study and evaluate the economic and social developments in the member countries to help generate proposals that will initiate and enhance co-operation among them, and

iii. To organise training programs in selected fields geared to the needs of member countries as well as to the general objectives of the Organisation of the Islamic Conference.

In addition to the implementation of the above mandate, the Centre assumes the role of focal point for technical co-operation activities and projects between the OIC system and the related UN agencies. It also acts as the major research arm of the OIC whereby it is assigned the task of preparing the main economic and social reports and background documents for the multitude of economic, social and technical co-operation meetings and conferences held every year at different levels under the umbrella of the OIC.

16. MAJOR ACTIVITY AREA(S):

• Training Activities

The Centre organises short-term courses/ workshops aimed at providing training to highlevel staff from the OIC countries who need to upgrade their skills in various socioeconomic fields. For this, the Centre collaborates with various national, regional and international organisations, such as the UN institutions, ministries of the OIC countries and other related organisations. It also compiles and disseminates information on the training expertise and the related physical/ institutional facilities of the OIC countries.

• Research Activities

The Centre undertakes socio-economic research on various issues of interest to the OIC member countries. It is also entrusted with the task of preparing technical studies, reports and background documents for presentation to the related OIC fora with a view to identifying the possibilities of co-operation among the OIC member countries in various socio-economic fields. For this purpose, the Centre is engaged in extensive research in a number of fields at country and sectoral levels.

• Statistical Activities

The Centre collects processes and disseminates socio-economic data and information relating to the OIC member countries. It maintains a specialised library and a system of computerised databases that support time series data on all member countries collected at regular intervals from the national statistical authorities in each member country.

Publications

The Centre ensures that the end-results of its activities in the areas of Statistics and Information, Technical Co-operation and Training, and Socio-economic Research are documented and disseminated as widely as possible through the publication of periodicals, directories, books, papers and reports in the three official languages of the OIC.

17. MAJOR RESEARCHES, PROJECTS, PROGRAMS:

- Training workshop on small and medium size enterprises development program
- Twenty-third session of the finance control organ of the OIC
- 18. PUBLICATIONS: Refer to <u>www.sesrtcic.org</u>

B10 – Communications and Multimedia Commission, Malaysia

- 1. POSTAL ADDRESS: Level 12, Menara Dato' Onn, Putra World Trade Centre 45, Jalan Tun Ismail 50480 Kuala Lumpur MALAYSIA
- **2. TELEPHONE:** +6 03 4047 7000
- **3. FAX:** +6 03 2694 0943
- 4. TELEX:
- 5. URL: <u>www.cmc.gov.my</u>
- 6. E-MAIL: <u>webmaster@cmc.gov.my</u>
- 7. **PARENT INSTITUTION OR BODY:** Minister of Malaysian Ministry of Energy, Communication and Multimedia
- 8. JOINT ORGANIZATION(S): None
- 9. HEAD OF THE CENTER: Tan Sri Nuraizah Abdul Hamid, Chairman
- 10. DATE OF ESTABLISHMENT: November1998
- 11. TYPE OF THE CENTER: Government Commission
- 12. **PROFITABILITY:** Non Profit
- **13.** NUMBER OF STAFF: 153 approx.
- 14. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: English

15. AIM OF THE CENTER

Vision

A globally competitive, efficient and increasingly self-regulating communications and multimedia industry generating growth to meet the economic and social needs of Malaysia.

Mission

Committed to:

a. Promoting access to communications and multimedia services;

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- b. Ensuring consumers enjoy choice and a satisfactory level of services at affordable prices;
- c. Providing transparent regulatory processes to facilitate fair competition and efficiency in the industry;
- d. Ensuring best use of spectrum and number of resources; and
- e. Consulting regularly with consumers and service providers and facilitating industry collaboration.

16. MAJOR ACTIVITY AREA(S)

The Malaysian Communications and Multimedia Commission (MCMC) is the regulator for the converging communications and multimedia industry. At the time of its creation, its key role was the regulation of the communications and multimedia industry based on the powers provided for in the Malaysian Communications and Multimedia Commission Act (1998) and the Communications and Multimedia Act (1998). Pursuant to these Acts the role of MCMC is to implement and promote the Government's national policy objectives for the communications and multimedia sector. MCMC is also charged with overseeing the new regulatory framework for the converging industries of telecommunications, broadcasting and on-line activities.

Economic regulation includes the promotion of competition and prohibition of anticompetitive conduct, as well as the development and enforcement of access codes and standards. It also includes licensing, enforcement of license conditions for network and application providers and ensuring compliance to rules and performance/service quality.

Technical regulation includes efficient frequency spectrum assignment, the development and enforcement of technical codes and standards, and the administration of numbering and electronic addressing.

Consumer protection emphasises the empowerment of consumers while at the same time ensures adequate protection measures in areas such as dispute resolution, affordability of services and service availability.

Social regulation which includes the twin areas of content development as well as content regulation; the latter includes the prohibition of offensive content as well as public education on content-related issues.

On 1 November 2001, MCMC also took over regulation of the Postal Industry and was appointed the Certifying Agency pursuant to the Digital Signature Act (1997).

17. LIST OF MAJOR RESEARCHES, PROJECTS AND CONSULTATION STUDIES DURING THE LAST THREE YEARS

Date	Discussion / Consultation
14 September 2002	Universal Service Provision - USP Claim Template
14 September 2002	Review of Universal Service Provision Determination
14 June 2002	Public Consultation Paper on Required Applications Services
13 May 2002	A Consultation Paper on Access Pricing
13 May 2002	A Consultation Paper on Cost of Capital
13 May 2002	A Consultation Paper on Local Access Funding
26 April 2002	Numbering and Electronic Addressing Consultation Paper
8 April 2002	Proposal for the Determination of Mandatory Standards for Quality of <u>Service</u>
7 February 2002	Industry Workshop - EAN-ICC Electronic Addressing and Numbering Initial Issues Paper - 3 October 2001
7 February 2002	Industry Workshop - EAN-ICC Electronic Addressing and Numbering Initial Issues Paper - A Supplemental Note - 3 October 2001
7 February 2002	Marketing Plan No. 1 of 2002 Issued pursuant to Regulation 6 of the Communications and Multimedia (Spectrum) Regulations 2000
21 December 2000	Access List Determination and Statement on Access Pricing Principles Consultation Paper
21 December 2000	System of Universal Service Provision Consultation Paper
11 November 2000	Concepts and Proposed Principles on the Implementation of IMT-2000 Mobile Cellular Services in Malaysia

source:

(http://www.cmc.gov.my/mcmc/facts_figures/papers/discussion/ViewFAFPaper.asp?cc=227993&pt=678845)

18. PUBLICATIONS

The Malaysian Communications and Multimedia Commission published the Framework for Industry Development (FID) at the end of 2001 to provide a five-year rolling plan for the development of the communications and multimedia sector in Malaysia.

When the FID, which covered the 2001- 2005, was drawn up, five major challenges were identified and articulated, which would have to be faced by the communications and multimedia industry, to achieve the National Policy Objectives set out in the Communications and Multimedia Act (1998). These challenges are:

- a) Upgrading Network Capabilities
- b) Improving Service Quality and Choice of Service
- c) Building Capacity
- d) Managing Resources Efficiently
- e) Regulating Efficiently

Other Publications:

Source: (http://www.cmc.gov.my/mcmc/facts_figures/codes_gl/index.asp)

- 1. Guideline on Dominant Position in a Communications Market
- 2. Guideline on Substantial Lessening of Competition in a Communications Market
- 3. Guideline on the Provisioning of VOIP (Voice over Internet Protocol) Service



1. POSTAL ADDRESS: PO Box 259 Amman 11941 JORDAN

- **2. TELEPHONE:** +962 6 5337184
- **3. FAX:** +962 6 5337168
- 4. URL: <u>http://www.nic.gov.jo</u>
- 5. E-MAIL: <u>info@nic.gov.jo</u>

6. PARENT INSTITUTION OR BODY:

Name: The Higher Council for Science and Technology

Postal address: PO Box 36 Jubeiha Amman 11941 JORDAN Telephone No.: +962 6 5340401 Fax No.: +962 6 5340589 URL: <u>www.hcst.gov.jo</u> E-mail: site_adm@hcst.gov.jo

- 7. JOINT ORGANIZATION(S): NA
- 8. HEAD OF THE CENTER: DR. YOUSEF NUSSEIR, PRESIDENT
- 9. DATE OF ESTABLISHMENT: 1993
- 10. TYPE OF THE CENTER: Semi-Government
- 11. PROFITABILITY: Non-profit
- **12. NUMBER OF STAFF:** 45
- 13. LANGUAGE(S) USED IN CENTER'S ACTIVITIES: Arabic, English.
- 14. AIM OF THE CENTER: To establish a National Information System whereby public sector organizations can exchange reliable and timely information to be used in decision making and research.
- **15. MAJOR ACTIVITY AREA(S):** Information awareness, information management, IT capacity building, e-government, IT in community development, TLD Administration and government ISP, network management, studies and consultations, national project management, human resources development.
16. MAJOR RESEARCHES, PROJECTS AND PROGRAMS:

 Studies: Following is the last study. Other studies are included under "Publications". Subject: ICT capacity building in Jordan : a study Date of accomplishment: Dec. 2002 Beneficiary Organization/Body: Name: ESCWA Country: Lebanon

• Information Policies and Strategies

Prepare a National Information Policies and Strategies Document for Jordan, 2001.

• Projects:

1. JITCC (Jordan Information Technology Community Centres)

An on-going project in the rural areas of Jordan to bridge the digital divide and utilize IT in community development (75 centres established).

2. National Legal Information System for Jordan.

17. PUBLICATIONS:

- 1. The Quarterly Newsletter, NUMU since 1997.
- 2. Information Sources in Jordan: The Public Sector, 1993.
- 3. Information Sources in Jordan : The Private Sector, 1994.
- 4. A Comparative Study Between the Information Sources in Jordan in the Private and the Public Sectors, 1994.
- 5. The Jordanian Common Communication Format for the Exchange of Bibliographic Information, 1994, 1997, 2002.
- 6. Principles and Methodology for Information System Development, 1994.
- 7. Principles and Methodology for Establishing Information Centres, 1994.
- 8. Requirements for the National Digital Network, 1995.
- 9. Economic Indicators for Computer Companies in Jordan, 1996.
- 10. Jordan's Information Policies and Strategies : Preparing Jordan for the 21st Century, 1996.
- 11. Principles of Information Security, 1997.
- 12. National Seminar on Cyber Economy : Proceedings, 1997.
- 13. Principles of Tendering and Evaluation, 1998.
- 14. Petra 99: Euro-Med Workshop: IT Applied to Natural Resources Management, Proceedings, 1999.

- 15. Proposed National Environment Information Strategy, 1999.
- 16. Annual Survey of Equipment and Human Resources In Information Technology in the Public Sector, 2000.

Guideline for a National IT Strategy

APPENDIX C : OBJECTIVES AND METHODOLOGY

Appendix C: Objectives and Methodology



slamic Development Bank (IDB) awarded the study for the development of a Guideline for a National IT Strategy to MSC Technology Centre Sdn. Bhd. (MSCTC) of Malaysia on 22/2/1422 corresponding to 16 May 2001. The objectives of the Guideline were to:

- 1) Promote IT awareness in member countries by developing a general Guideline for a National IT Strategy and provide technical assistance on request to member countries willing to adopt the Guideline to their needs and conditions.
- 2) Identify leading centres of excellence to enable superior coordination and better utilisation of their services and resources.

Methodology

MSCTC used a three-step process: Analysis of global ICT development including the ICTdevelopment level of IDB member countries; analysis of selected member countries' ICT strategy; and the development of the model.

The main method employed for step one is desk research i.e. gathering and analysing data from public sources such as Internet and published reports. For the second step, deeper analysis was carried out on seven member countries (Appendix A), representing the three broad categories ranging from advanced to the least developed. The methods used include interviews (face to face or over the telephone), questionnaire and correspondence. Interviews and group discussions with key stakeholders were carried out during visits to Jordan, Syria, Bahrain, Brunei, Saudi Arabia, U.A.E. and Morocco. MSCTC also obtained information from trade representatives of Egypt, Albania, Kyrgzstan, Pakistan, and Sudan. And central to the approach of the study is the direct experience and in-depth knowledge of the study team in the actual development of Malaysia's Multimedia Super Corridor initiative and the related National Information Technology Agenda (NITA).

Appendix C : Objectives and Methodology

Guideline for a National IT Strategy

APPENDIX D: IDB ICT INDEX

The IDB ICT Index calculation method is similar to the method used to calculate the Human Development Index (HDI) in the annual human development report published by the United Nations Development Program (UNDP). The IDB ICT Index measures the cumulative of five component indexes:

- a) <u>Economic Index</u>: composite of GDP per capita, export of goods and services as % of GDP, Electricity usage per capita, and GDP per capita annual growth rate (1990-2000).
- b) <u>Education Index</u>: composite of adult literacy rate, combined enrolment in primary, secondary and tertiary, % of tertiary students in science, mathematics & engineering .
- c) <u>ICT Diffusion Index</u>: composite of number of ISP, number of Internet hosts (per 1000 people), number of PC (per 1000 people), and number of Internet users (per 1000 people).
- d) <u>Telecommunication Index</u>: composite of number of television, radio, telephone, and mobile sets.
- e) <u>Innovation Index</u>: composite of number of scientists and engineers per 1 million people, patents per 1000 people, high technology exports as % of exports, R&D expenditure as % of GDP, number of scientists & engineers in R&D.

However, due to lack of data for many member countries, Innovation Index could not be reasonably determined and hence not included in this version of the ICT Index. It is recommended that with more available data for member countries in the coming years, IDB includes this component index for the total ICT Index.

The data for the calculation of the various indexes were obtained from the following sources:

- 1. Human Development Report (HDR) 2002
- 2. International Telecommunications Union (ITU) (<u>www.itu.int</u>)
- 3. Nua.com (www.nua.com) for Internet related data
- 4. Islamic Development Bank Annual Report 2000-2001
- 5. CIA World Factbook 2002
- 6. Internet Software Consortium (<u>www.isc.org</u>)

D1- IDB Member Countries ICT Index

Countries	Economic Index	ICT Diffusion Index	Education Index	Telecom Index	Innovation ¹ Index	ICT Index
United Arab Emirates	0.56	1.00	0.77	1.00	0.00	1.00
Malaysia	1.00	0.67	0.61	0.53	1.00	0.85
Turkey	0.43	0.43	0.74	0.96	0.57	0.77
Lebanon	0.50	0.68	0.77	0.47	0.00	0.73
Bahrain	0.94	0.22	0.66	0.59	0.00	0.73
Saudi Arabia	0.44	0.92	0.68	0.35	0.00	0.72
Egypt	0.35	0.97	0.63	0.42	0.30	0.71
Kuwait	0.80	0.16	0.73	0.54	0.34	0.67
Indonesia	0.39	0.48	0.81	0.55	0.25	0.67
Brunei	0.51	0.32	0.71	0.57	0.11	0.64
Iran	0.42	0.18	0.85	0.40	0.47	0.56
Maldives	0.84	0.04	0.69	0.13	0.06	0.51
Qatar	0.40	0.06	0.62	0.50	0.00	0.48
Tunisia	0.53	0.06	0.77	0.14	0.24	0.45
Suriname	0.37	0.12	0.70	0.29	0.01	0.44
Algeria	0.25	0.12	0.91	0.18	0.05	0.44
Syria	0.44	0.03	0.77	0.11	0.02	0.41
Albania	0.37	0.14	0.78	0.06	0.01	0.41
Pakistan	0.19	0.57	0.33	0.20	0.02	0.39
Kazakhstan	0.15	0.00	1.00	0.13	14.24	0.39
Morocco	0.23	0.17	0.61	0.25	0.88	0.38
Jordan	0.33	0.11	0.57	0.18	0.10	0.36

¹ Due to lack of data to compute the Innovation Index, it is not included in the above ICT Index calculation. (See table on Innovation Index to identify data selected)

Countries	Economic Index	ICT Diffusion Index	Education Index	Telecom Index	Innovation ¹ Index	ICT Index
Gabon	0.28	0.03	0.62	0.14	0.00	0.32
Uganda	0.35	0.06	0.55	0.04	0.23	0.30
Sudan	0.49	0.02	0.36	0.12	0.00	0.30
Oman	-0.17	0.13	0.73	0.20	0.05	0.27
Bangladesh	0.31	0.19	0.31	0.08	0.01	0.27
Guinea	0.26	0.02	0.58	0.02	0.00	0.26
Libyan Arab Jamahiriya	0.00	0.02	0.68	0.15	0.10	0.26
Mozambique	0.37	0.16	0.27	0.01	0.02	0.24
Yemen	0.35	0.02	0.39	0.04	0.00	0.24
Togo	0.12	0.06	0.55	0.03	0.76	0.23
Mauritania	0.26	0.16	0.32	0.01	0.00	0.23
Kyrgyzstan	-0.02	0.01	0.65	0.09	4.36	0.22
Cameroon	0.08	0.03	0.47	0.04	0.01	0.19
Senegal	0.20	0.03	0.29	0.07	0.16	0.18
Benin	0.21	0.03	0.33	0.02	0.05	0.18
Burkina Faso	0.24	0.02	0.32	0.01	0.02	0.18
Gambia	0.17	0.05	0.32	0.03	0.45	0.17
Turkmenistan	-0.30	0.00	0.71	0.11	2.49	0.16
Mali	0.20	0.03	0.28	0.01	0.00	0.16
Chad	0.01	0.02	0.39	0.02	0.00	0.13
Guinea Bissau	0.03	0.03	0.30	0.01	0.00	0.11
Tajikistan	-0.56	0.00	0.83	0.06	0.66	0.10
Comoros	-0.07	0.02	0.36	0.01	0.01	0.10
Djibouti	-0.15	0.01	0.34	0.02	0.00	0.07
Niger	-0.01	0.02	0.13	0.01	0.06	0.04
Iraq	0.00	0.02	0.00	0.07	0.00	0.03
Somalia	0.00	0.02	0.00	0.01	0.00	0.01
Afghanistan	0.00	0.02	0.00	0.00	0.00	0.01
Palestine	0.00	0.00	0.00	0.00	0.00	0.00
Sierra Leone	-0.43	0.02	0.25	0.02	0.00	-0.04

D2 – IDB Member Countries Economic Index

Countries	Population million 2000 ²	GDP per capita (PPP US\$)	Export Goods & Services (% of GDP)	Electricity Usage per capita (kilowatt- hours)	GDP Per Capita Annual Growth (90-2000)	Economic Index
Malaysia	22,229,040	9068	125	2,474	4.40	1.00
Bahrain	645,361	15084	82	8,205	1.70	0.94
Maldives	310,674	4485	104		5.40	0.84
Kuwait	2,041,961	15799	57	14,011	-1.40	0.80
United Arab Emirates	2,407,460	17935		10,643	-1.60	0.56
Tunisia	9,705,102	6363	44	911	3.00	0.53
Brunei	343,653	16779		7,124	-0.70	0.51
Lebanon	3,627,774	4308	13	1,778	4.20	0.50
Sudan	36,080,373	1797	17	46	5.20	0.49
Saudi Arabia	5,360,526	11367	50	4,710	-1.20	0.44
Syria	16,728,808	3556	38	863	2.80	0.44
Turkey	66,493,980	6974	24	1,396	2.10	0.43
Iran	66,128,965	5884	35	1,407	1.90	0.42
Qatar	769,152			14,871		0.40
Indonesia	228,437,870	3043	39	345	2.50	0.39
Suriname	433,998	3799	17		3.00	0.37
Mozambique	19,317,057	854	15	53	3.90	0.37
Albania	1,221,175	3506	19	783	2.70	0.37
Yemen	18,078,035	893	50	0	2.30	0.35
Uganda	23,985,712	1208	10		3.80	0.35
Egypt	69,536,644	3635	16	900	2.50	0.35
Jordan	5,153,378	3966	42	1,207	1.00	0.33
Bangladesh	131,269,860	1602	14	89	3.00	0.31
Gabon	1,221,175	6237	37	700	0.10	0.28
Mauritania	2,747,312	1677	41		1.20	0.26

² Population was not included in the economic index calculation

Countries	Population million 2000 ²	GDP per capita (PPP US\$)	Export Goods & Services (% of GDP)	Electricity Usage per capita (kilowatt- hours)	GDP Per Capita Annual Growth (90-2000)	Economic Index
Guinea	7,613,870	1982	26		1.70	0.26
Algeria	3,736,053	5308	42	207	-0.10	0.25
Burkina Faso	12,272,281	976	11		2.40	0.24
Morocco	30,645,305	3546	31	430	0.60	0.23
Benin	6,590,782	990	15	53	1.80	0.21
Senegal	10,284,929	1510	31	114	0.90	0.20
Mali	11,008,518	797	25		1.30	0.20
Pakistan	144,616,631	1928	16	321	1.20	0.19
Gambia	1,411,205	1649	48		-0.30	0.17
Kazakhstan	16,731,303	5871	59	2,448	-3.10	0.15
Togo	5,153,088	1442	36		-0.40	0.12
Cameroon	15,803,220	1703	31	184	-0.80	0.08
Guinea Bissau	1,315,822	755	32		-1.10	0.03
Chad	8,707,678	871	17		-0.80	0.01
Libyan Arab Jamahiriya	5,240,599	·	·	4	·	0.00
Iraq	23,331,985					0.00
Somalia	4,484,773					0.00
Afghanistan	26,813,057					0.00
Palestine						0.00
Niger	10,355,156	746	15		-1.00	-0.01
Kyrgyzstan	4,753,003	2711	97		-5.10	-0.02
Comoros	596,202	1588	26		-2.40	-0.07
Djibouti	460,700		45		-3.90	-0.15
Oman	2,622,198			2,448	-3.10	-0.17
Turkmenistan	4,603,244	3956	63	944	-8.00	-0.30
Azerbaijan	7,771,092	2936	41	1,750	-7.30	-0.32
Sierra Leone	5,426,618	490	17		-6.50	-0.43

(..) Not available

D3 - ICT Diffusion Index

Countries	ISP	Internet Hosts (per 1000 people) ³	Personal Computers (per 1000 people)	Internet Users (per 1000 people) ³	ICT Diffusion Index
United Arab Emirates	1	14.300	153.49	305.301	1.00
Egypt	50		22.06	6.471	0.97
Saudi Arabia	42	0.200	60.17	37.310	0.92
Lebanon	22	1.700	50.05	82.695	0.68
Malaysia	7	3.100	103.14	166.449	0.67
Pakistan	30		4.18	0.926	0.57
Indonesia	24	0.100	9.9	8.755	0.48
Turkey	22	1.100	38.05	3.008	0.43
Brunei	2	14.400	70.06	87.297	0.32
Bahrain	1	1.700	100.2	58.107	0.22
Bangladesh	10		1.46	0.762	0.19
Iran	8		62.83	3.780	0.18
Morocco	8	0.100	12.35	6.526	0.17
Kuwait	3	1.800	130.59	24.486	0.16
Mauritania	5		16	20.020	0.16
Mozambique	8		3.05	1.553	0.16
Albania	7	0.100	6.3	2.047	0.14
Oman	1	0.300	31.52	34.322	0.13
Algeria	2		21.6	26.766	0.12
Suriname	2		2.4	26.979	0.12
Jordan	5	0.100	22.49	2.472	0.11
Qatar	1	0.100	150.39	3.900	0.06
Togo	3		13.5	0.000	0.06
Uganda	2		70.4	1.042	0.06

³ Source taken from CIA World Factbook 2001

Countries	ISP	Internet Hosts (per 1000 people) ³	Personal Computers (per 1000 people)	Internet Users (per 1000 people) ³	ICT Diffusion Index
Tunisia	1		22.86	10.304	0.06
Gambia	2		4.3	3.543	0.05
Azerbaijan	2	0.200		1.544	0.04
Maldives	1	1.000	1.7	6.438	0.04
Guinea Bissau	1		25.55	3.040	0.03
Mali	1		16.8	3.634	0.03
Gabon	1		9.79	4.094	0.03
Senegal	1	0.200	12	2.917	0.03
Cameroon	1		17.64	1.898	0.03
Syria	1		15.44	1.793	0.03
Benin	1	0.000	15.2	1.517	0.03
Libya	1			1.908	0.02
Chad	1		3.8	1.263	0.02
Comoros	1	0.100	0.47	1.342	0.02
Sudan	1	0.000	3.22	0.831	0.02
Guinea	1		4.8	0.657	0.02
Yemen	1		1.91	0.830	0.02
Sierra Leone	1			0.921	0.02
Burkina Faso	1		1.26	0.815	0.02
Niger	1		0.49	0.483	0.02
Somalia	1			0.045	0.02
Iraq	1			0.000	0.02
Afghanistan	1			0.000	0.02
Djibouti			10.19	3.039	0.01
Kyrgyzstan		0.400		2.104	0.01
Turkmenistan		0.300		1.303	0.00
Kazakhstan		0.500		0.598	0.00
Tajikistan				0.456	0.00
Palestine				0.000	0.00

(..) Not available

D4 -	Education Ind	lex
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Countries	Adult Literacy rate (% age 15 and above)	Combined primary, secondary and tertiary	Tertiary students in science, maths, engineering (% of all tertiary students) 94-97	Education Index
Kazakhstan	98.0	77	42	1.00
Algeria	66.7	72	50	0.91
Iran	76.3	73	36	0.85
Tajikistan	99.2	67	23	0.83
Indonesia	86.9	65	28	0.81
Albania	84.7	71	22	0.78
Lebanon	86.0	78	17	0.77
Tunisia	71.0	74	27	0.77
Syria	74.4	63	31	0.77
United Arab Emirates	76.3	68	27	0.77
Turkey	85.1	62	22	0.74
Oman	71.7	58	30	0.73
Kuwait	82.0	59	23	0.73
Turkmenistan	98.0	81		0.71
Brunei	91.5	76	6	0.71
Suriname	94.0	82		0.70
Maldives	96.7	77		0.69
Libya	80.0	92		0.68
Saudi Arabia	76.3	61	18	0.68
Azerbaijan	97.0	71		0.67
Bahrain	87.6	80		0.66
Kyrgyzstan	97.0	68		0.65
Egypt	55.3	76	15	0.63
Gabon	71.0	86		0.62
Qatar	81.2	75		0.62
Morocco	48.9	52	29	0.61
Malaysia	87.5	66		0.61
Guinea	41.0	28	42	0.58
Jordan	89.7	55		0.57
Uganda	67.1	45	15	0.55
Togo	57.1	62	11	0.55

Countries	Adult Literacy rate (% age 15 and above)	Combined primary, secondary and tertiary	Tertiary students in science, maths, engineering (% of all tertiary students) 94-97	Education Index
Cameroon	75.8	43		0.47
Chad	42.6	31	14	0.39
Yemen	46.3	51		0.39
Sudan	57.8	34		0.36
Comoros	55.9	35		0.36
Djibouti	64.6	22		0.34
Pakistan	43.2	40		0.33
Benin	37.4	45		0.33
Gambia	36.6	45		0.32
Mauritania	40.2	40		0.32
Burkina Faso	23.9	23	18	0.32
Bangladesh	41.3	37		0.31
Guinea Bissau	38.5	37		0.30
Senegal	37.3	36		0.29
Mali	41.5	28		0.28
Mozambique	44.0	23		0.27
Sierra Leone	36.0	27		0.25
Niger	15.9	16		0.13
Somalia				0.00
Iraq				0.00
Palestine				0.00
Afghanistan				0.00

(..) Not available

D5 - Telecommunication Adoption Index

Countries	Television (per 1000)	Radio (per 1000)	Telephone (per 1000)	Mobile (per 1000)	Felecommuni cation Index
United Arab Emirates	129	341	391	548	1.00
Brunei	570	928	245	289	0.84
Bahrain	426	524	250	300	0.75
Kuwait	429	575	244	249	0.70
Saudi Arabia	951	1166	137	64	0.68
Turkey	314	170	280	246	0.64
Lebanon	325	786	195	212	0.62
Algeria	830	1900	57	3	0.61
Qatar	299	333	268	202	0.60
Malaysia	162	202	199	213	0.48
Oman	610	534	89	65	0.43
Suriname	145	691	174	94	0.41
Albania	332	663	39	8	0.25
Jordan	97	322	92	58	0.22
Iran	70	257	149	15	0.22
Libya	139	258	108	7	0.20
Morocco	101	217	50	83	0.19
Egypt	111	295	86	21	0.18
Turkmenistan	178	266	82	2	0.18
Gabon	52	170	32	98	0.17
Azerbaijan	22	23	104	56	0.17
Tunisia	95	212	90	6	0.16
Maldives	32	113	91	28	0.14
Kazakhstan	0	0	113	12	0.12
Kyrgyzstan	44	109	77	2	0.11
Tajikistan	131	196	36		0.11
Syria	0	0	103	2	0.10

Countries	Television (per 1000)	Radio (per 1000)	Telephone (per 1000)	Mobile (per 1000)	Felecommuni cation Index
Indonesia	60	138	31	17	0.09
Senegal	35	121	22	26	0.08
Sudan	66	209	12	1	0.06
Iraq	75	208			0.06
Djibouti	61	113	15		0.05
Gambia	3	139	26	4	0.05
Cameroon	28	144	6	10	0.05
Pakistan	21	93	22	2	0.04
Sierra Leone	10	206	4	2	0.04
Yemen	26	58	19	2	0.04
Mauritania	23	131	7	3	0.04
Benin	9	94	8	9	0.03
Comoros	2	151	10	0	0.03
Uganda	13	108	3	8	0.03
Chad	1	192	1	1	0.03
Somalia	30	105			0.03
Guinea	11	47	8	5	0.02
Тодо	14	182	9	11	0.02
Niger	12	66	2		0.02
Guinea Bissau	0	37	9	0	0.01
Bangladesh	6	47	4	1	0.01
Mozambique	5	38	4	2	0.01
Mali	4	52	3	1	0.01
Burkina Faso	0	0	4	2	0.01
Afghanistan	4	6			0.00
Palestine					0.00

(..) Not available

D6	Innov	ation	Index
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Countries	Scientists and engineers (per million people 1990-2000)	Patents (per 1,000 people)	High Tech Exports (as % of exports)	R&D expenditur es % of GNP 1990 - 2000	Scientists and engineers in R&D (per million 1990 – 2000)	Innovation Index
Kazakhstan		55	10	0.30	574.00	1.00
Kyrgyzstan	574	14	5	0.20	574.00	0.31
Turkmenistan		10	5			0.17
Malaysia	154		59	0.40	154.00	0.07
Morocco		3.0000	12			0.06
Azerbaijan	2735		4	0.20		0.06
Тодо	102		0	8.40		0.05
Tajikistan	660	2.0000				0.05
Turkey	303		5	0.50	303.00	0.04
Iran	590	1	2	0.50		0.03
Gambia		1.0000	17			0.03
Kuwait	214		1		214.00	0.02
Egypt	493		0	1.90		0.02
Indonesia	182		16	0.10		0.02
Tunisia	124		2	0.30	124.00	0.02
Uganda	25		10	0.80	25.00	0.02
Senegal	2		13			0.01
Brunei			9			0.01
Jordan			8			0.01
Libya	361		0			0.01
Maldives			5			0.00
Niger			5			0.00
Algeria			4			0.00
Oman			4			0.00
Benin	174					0.00
Mozambique			2			0.00

Countries	Scientists and engineers (per million people 1990-2000)	Patents (per 1,000 people)	High Tech Exports (as % of exports)	R&D expenditur es % of GNP 1990 - 2000	Scientists and engineers in R&D (per million 1990 – 2000)	Innovation Index
Burkina Faso	17			0.20		0.00
Pakistan	78					0.00
Syria	29		1			0.00
Bangladesh	51					0.00
Albania			1			0.00
Suriname			1			0.00
Cameroon			1			0.00
Comoros			1			0.00
Lebanon						0.00
United Arab Emirates			0			0.00
Saudi Arabia						0.00
Bahrain			0			0.00
Gabon						0.00
Qatar						0.00
Guinea						0.00
Chad						0.00
Yemen			0			0.00
Sudan						0.00
Djibouti						0.00
Mauritania						0.00
Guinea Bissau						0.00
Mali						0.00
Sierra Leone						0.00
Somalia						0.00
Iraq						0.00
Afghanistan						0.00
Palestine						0.00

(...) Not available

Guideline for a National IT Strategy

APPENDIX E :

GLOSSARY AND DEFINITIONS

Appendix E : Glossary and Definitions

Appendix E – Glossary and Definitions

ADSL	_	Asynchronous Digital Subscriber Line
ASEAN	_	Association of South East Asian Nations
ASP	_	Application Services Provider
ATM	_	Asynchronous Transfer Mode
CRM	_	Customer Relationship Management
EDI	_	Electronic Data Interchange
EG	_	Electronic Government
ERP	_	Enterprise Resource Management
EP	_	Electronic Procurement
EU	_	European Union
GDP	_	Gross Domestic Product
GNP	_	Gross National Product
GSM	_	Global System for Mobile Communication
HDI	_	Human Development Index
HRD	-	Human Resource Development
IC	_	Innovation Cluster
ICT	-	Information & Communication Technology
IDB	-	Islamic Development Bank
IP	_	Internet Protocol

IPR	_	Intellectual Property Right
IRTI	_	Islamic Research and Training Institute
IRTIC	_	IRTI Information Center
ISDN	_	Integrated Services Digital Network
ISP	_	Internet Service Provider
IT		Information Technology
ITU	-	International Telecommunications Union
LDMC	-	Least Developed Member Country
MDC	_	Multimedia Development Corporation
MIMOS	-	Malaysian Institute of Microelectronic Systems
MNCs	-	Multinational Corporations
MRP	-	Manufacturing Resource Planning
MSC	-	Multimedia Super Corridor
NGO	-	Non Governmental Organisation
OECD	-	Organisation for Economic Cooperation and Development
РТТ	-	Post, Telephone and Telegraph; generic name for a carrier
SCM	-	Supply Chain Management
SME	-	Small and Medium Enterprises
SMI	-	Small and Medium Industries
UN	_	United Nations
UNDP	_	United Nations Development Programme
WTO	_	World Trade Organisation

APPENDIX F :

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