

## 11. NATIONAL ICT STRATEGIES FOR KNOWLEDGE-BASED DEVELOPMENT

### 11.1 INTRODUCTION – PROMOTING NATIONAL ICT STRATEGIES

The ICT revolution is a massive challenge for politicians and for the business sector. It is redefining, sometimes abolishing, the ‘borders’ between industries, and revealing the inadequacy of existing political and economic institutional structures. Key trends in the governance activities of international organisations are setting the framework for the development of national and regional ICT strategies (see Chapters 9 and 10). The trends include the continuing powerful role that these organisations play both in implementing and enforcing current rules and in deciding upon the new rules and regulations to reflect the technological, commercial, and political shifts in ICT and service markets. The leading international organisations are reshaping themselves to increase their responsiveness and flexibility in the face of dramatic market changes. The growing power of private sector organisations in shaping emergent ‘knowledge societies’ is expressed through private sector consortia that are setting international standards, through organisations like the Global Information Infrastructure Commission, and through established institutions like the International Telecommunication Union and the World Bank which are becoming more open to private sector partnerships (Wilson 1996a).

BOX 11.1 – COORDINATION ACTION BY THE G-7 COUNTRIES AND DEVELOPING COUNTRIES

- Integrated systems to meet people’s basic needs (using ICTs as tools and focusing on rural areas)
- Universal access (for all sectors of society)
- Innovation to develop appropriate applications and content
- Human resource development
- Support for business, and particularly small and medium sized enterprises
- Support for good governance
- Promotion of cultural heritage
- Infrastructure development (using appropriate technology and linked with universal access goals)
- Special assistance for countries with special circumstances

Source: ISAD Conference (1996a,b).

An international consensus has emerged on the urgent need for developing countries to prepare national ICT strategies to provide a framework to govern the allocation of resources among different groups of users and sectors and to establish priorities (Harfoush and Wild 1994). There is also consensus about the necessity to focus on

the financial measures needed to reduce the gap between the developing and the industrialised countries in their capacity to reap the potential benefits of the global information society (GIS). The Information Society and Development (ISAD) conference held in South Africa in 1996 called for coordinated action by the G-7 countries and the developing countries to promote the use of ICTs (see Box 1.1).

Participants in the conference emphasised the need to prepare national and regional inventories of existing ICT projects; to ensure that the appropriate national or regional institutions are set up to provide for the coordination of ICT strategies; and to promote widespread dissemination of relevant information. This chapter offers a practical guide to the responses on the new consensus on the importance of the global information infrastructure and emerging national information infrastructures in developing countries. Section 11.2 focuses on some of the strategies that are already in place. Section 11.3 emphasises the need for integrated ICT strategies and the importance of coordinated action to maximise the positive contributions of investment in the technologies and in capability development. Section 11.4 looks at what steps are necessary to mobilise resources to develop the national information infrastructure. This section offers guidelines for policy-makers and stakeholders in the business community to assist in devising ICT strategies that will be effective and responsive to development priorities (see also Annex 3). Section 11.5 provides further guidelines on measures that can be taken to improve the efficiency and to mobilise resources for building national information infrastructures. In section 11.6 the immediate actions which can be taken by the policy and business communities are outlined.

### 11.2 HARNESSING ICTs FOR DEVELOPMENT

Some of the national ICT strategies summarised in this section are being implemented in countries that have achieved a relatively high level of telephone penetration on an aggregate national basis. For example, Bermuda, Singapore, Malta, Taiwan (Pr. China), and the Republic of Korea have penetration rates exceeding 40 main telephone lines per 100 population. These countries are succeeding in addressing the ‘telephony access’ problem although there are problems of uneven distribution of access. They face continuing challenges in terms of building ICT-related capabilities within the labour force and ensuring that the communication infrastructure is managed in a way that brings benefits both to the economy and to society as a whole. Malaysia, Jamaica,

Mexico, and South Africa (with telephone penetration rates of between 9 and 16 in 1995) either already have, or expect to have, modern backbone networks in place by the end of the century. They face the challenge of encouraging inward investment to provide services to meet business requirements in urban areas and of extending access to the urban and rural poor. They also have to encourage capability-building and put new legislative and regulatory frameworks in place.

In Indonesia, Viet Nam, and Ethiopia which each have telephone penetration rates of less than two per 100 in habitants, the differences in their capacity to address the crucial financing issue are dramatic. Taking investment in the telecommunication infrastructure as an example, Indonesia experienced an increase in investment of 42 per cent between 1990 and 1994.<sup>1</sup> Ethiopia saw investment decline by 29 per cent over the same period. These disparities in the capacity to attract investors to build national information infrastructures clearly call for different kinds of approaches to the role of ICTs in the development process. The emphasis on strategies aimed at producing or using ICTs and services is changing in each country.

The emphasis in each of these countries on entry into international equipment and service markets as compared to that given to the diffusion and use of ICTs in the domestic economy also varies considerably.

Six of the countries in this sample are aiming to become either global or regional hubs for electronic services: Bermuda, Singapore, Jamaica, Malaysia, Malta, and Thailand.

### *Bermuda*

Bermuda is a small country which describes itself as the 'Information Island of the 21<sup>st</sup> Century' (Sculley 1997). Its hope is to become a global electronic hub for storing, processing, and disseminating digital information. Teleports and submarine optical fibre cables link the island to global networks. The Bermuda Stock Exchange intends to launch an offshore electronic stock exchange and discussions are underway about the establishment of a Catastrophe Risk Exchange. Internet World Wide Web services are providing background information about business opportunities for potential investors. The aim is to become 'the Switzerland of data' for corporations, and a centre for the electronic sale of offshore financial derivatives as well as a major distributor of electronic software. The country faces several barriers to achieving these goals including the relatively high cost of telecommunication services and the need to provide appropriate training to upgrade the ICT-related skills of the local population.

### *Singapore*

Singapore's 'Intelligent Island Vision' is embedded in the IT2000 master plan (National Computer Board n.d.a,b,c, 1996, 1997b). This strategy aims to ensure that

ICTs are pervasively used in every aspect of professional and personal life. The vision calls for computers and other information appliances located in homes, offices, schools, and factories to be linked by a broadband network built, owned, and operated by an industry consortium. The Singapore ONE network will provide access to public sector services and facilitate (inter) government transactions. Singapore is bidding to be a global 'centre of excellence' for science and technology, a high-value location for production, and a strategic node in global commerce, communication, and information networks. The IT2000 strategy has been developed by the National Computer Board (NCB) in collaboration with private sector stakeholders. NCB is responsible for implementing more than sixty sectoral applications and the key goals of the strategy are summarised in Box 11.2. In July 1996 the government launched the Local Industry Upgrading Programme (LIUP) involving multinational and local companies to nurture the local ICT industry and encourage industry collaboration. The NCB provides a 'one-stop-shop' to assist in the identification of local collaborators and projects and in formulating the terms of collaboration.

BOX 11.2 - IT2000 GOALS IN SINGAPORE

- Create an IT culture
- Plan IT human resource development
- Nurture the IT industry
- Evolve an information infrastructure
- Deploy IT2000 flagship projects
- Exploit IT in government

Source: Adapted from National Computer Board (n.d.a).

### *Jamaica*

As the size of the international information services market grows, opportunities for Jamaican businesses are expected in the creation and distribution of content using on-line services (Bennett 1995; Patterson 1995; Commonwealth Secretariat 1988; Girvan 1994c). The information processing services industry has been slow to take off because of the dualistic structure of the industry where some firms have much greater access to financial resources than others. This is the result of a number of factors: preferential treatment by foreign investors, higher than estimated costs of marketing, the need to develop a suitably trained work force, and the high costs of access to the Internet. Obstacles to the procurement of loans indicate the need for greater involvement of banks in providing financial support for the ICT industry. The establishment of a government body that would focus on the development of the ICT sector and support public institutions in their use of ICTs has been recommended.

ICTs are not being exploited to their full potential because decision-makers have yet to become completely convinced

of the need for investment in ICTs. Recommendations also include the development of ICT services and an 'IT park', measures to encourage venture capitalists in the development of 'digital' content publishing, human resource development, and the telecommunication infrastructure. Other recommendations include measures to update the general legal framework for competition policy and legislation for the ICT sector. The government and the private sector have been criticised about the lack of ICT policies and forward planning. For example, the local industry depends upon government computerisation projects to generate revenues, but frequently these projects are given to overseas consultants. Software and value-added products and services are often imported from the industrialised countries and most local companies are active only in the hardware and pre-packaged software segments of the market where the primary focus is on software development and product enhancement. Trained personnel with ICT-related skills do exist, but there are major deficiencies at management level. Initiatives in the ICT sector need to be complemented by measures to strengthen the competitiveness of firms and to implement development objectives.

### Malaysia

An ICT policy was introduced in Malaysia in the early 1980s and planning is the responsibility of numerous committees, including the National Consultative Committee on Information Technology (NCCIT) formed in 1988 (Raman and Yap 1996; Shariffadeen 1994a,b, 1995; Baharuddin et al. 1994; Karthigesu 1996; Hashim 1996). The country's strategic approach to ICT planning and management includes establishment of the National IT Council (NITC) which provides advisory and consultative assistance. The Council is expected to ensure that the social implications of ICT are considered along with the need to develop human and technical capabilities. The national strategy is linked to the Vision 2020 development policy which emphasises that the ultimate purpose of development should be for human development. Projects include the Malaysian 'Multimedia Super Corridor' incorporating a new airport and 'intelligent' multimedia cities to attract investors, and use of computers in education. A Multimedia Development Corporation has been established to coordinate the development of Malaysia's own 'Silicon Valley'. The goal is to create an environment that will attract investment and highly skilled knowledge workers. Potential investors include the Nippon Telegraph and Telephone Company, Shell, Reuters, and Oracle (Kynge 1997). Skills, values, and knowledge are accorded great importance. Policies are being designed to treat people as 'learning individuals' and to ensure that ICTs play a facilitating role. The strategy emphasises the need to prepare Islamic countries for the information revolution.

### Malta

Malta is implementing a National Strategy for Information Technology. In 1992 the Malta Council for Science and Technology (MCST), the advisory body to government on national science and technology policies, organised a national conference entitled 'Vision 2000: Developing Malta as Regional Hub through Communications Technology'. This led to the commissioning by Government through MCST of a study involving over 100 experts and practitioners from various sectors to develop a national strategy for ICT (Camilleri 1994a,b,c). The study combined a macro-perspective on likely political scenarios influencing economic and ICT strategies with a micro-perspective on ICT issues in education and human resource training, business, and telecommunication infrastructure development. The strategy was presented to the Government in 1994 and set in motion recommendations in several general strategic directions and related initiatives in the education and telecommunication sectors. A review of the National Strategy for Information Technology was carried out in early 1997 and one of the major recommendations was the establishment of a National Commission for Information Technology (see Box 11.3).

BOX 11.3 - NATIONAL COMMISSION FOR INFORMATION TECHNOLOGY, MALTA

The Commission is focusing on seven major areas:

- Nurturing an IT culture
- Promoting the development of skills in ITs
- Encouraging investment in state-of-the-art telecommunication services
- Aiding the effective use of IT in Maltese organisations
- Promoting an indigenous export-oriented IT industry
- Helping to widen the use of IT to enhance government information services
- Bringing about sectoral cohesion through IT

Source: Balzan and Vella (1997).

In July 1997, this Commission was set up with a chairperson from the private sector, and comprises representatives of the academic, private, and public sectors. Its main objectives are to keep the national IT strategy updated, to take responsibility for the implementation of certain parts of the strategy, and to coordinate the work of public and private organisations involved in this strategy.

Malta's IT strategy takes into account the multiple dimensions of IT including the technological, economic, spatial, occupational, social, cultural, and legislative. The approach stresses the importance of private sector involvement and investment for successful implementation of the strategy. It aims to stimulate markets for ICT services and goods and to achieve effective deployment of ICTs in

all sectors. It is also concerned with the development of the necessary skills and infrastructure. The role of government is to provide market guidance and targeted incentives for the country's small and medium sized enterprises.

### *Thailand*

Thailand's ICT strategy includes measures to encourage investment in an equitable national information infrastructure. It emphasises investment in the skills base to increase literacy and good governance. Thailand's goal is to become a regional hub in South East Asia for financial services, manufacturing, commerce, transport, tourism, and human resource training. The telecommunication network is digital with optical fibre and satellite links between the major cities, but there are problems in extending access to rural areas. Although the telephone penetration rate reached one for every ten people in 1996, only about a third of the population in the largest cities had benefited as many tambons (sub-districts) and almost all the 60,000 villages were without public telephone services. The country also faces a shortage of skilled people, the estimated shortfall being close to 10,000 in skills in software and telecommunication engineering fields in 1996. Investment in ICTs to provide public services lags behind the private sector. The Five-Year Rural Thailand Communications Expansion and Modernisation Programme, an independent telecommunication regulatory authority, and a School Informatisation Action Programme are among the recent government measures. This last aims to achieve a PC density in all state schools of at least one for every 80 primary school children, and one for every 40 secondary school children. The IT2000 policy supports ongoing policy research, and the local ICT industry (Durongkaveroj 1996).

Indonesia, Korea (Republic of), Mexico, and Taiwan (Pr. China) all have mixed strategies that emphasise both ICT producer and user capabilities with an outward orientation toward the emerging international market opportunities in hardware and services production.

### *Indonesia*

There is a five-year development plan which includes the telecommunication sector. It is being opened to private sector participation in order to increase telephone density and improve services in rural areas (Idris 1996). The telecommunication infrastructure is seen as vital to the country's economic and social development. Mobile satellite technology will extend access to the infrastructure but a 'Universal Access Fund' is being established to reduce the costs for individual subscriber lines in public areas. Television broadcasting is the main infrastructure for disseminating information, education, and entertainment because of its wide coverage of rural and urban areas.

### *The Republic of Korea*

A 'Blueprint' for an information society has been launched

designed to develop and promote the use of the national information infrastructure, strengthen competition in the ICT industry, support firms in the broadcasting sector, improve the quality of services, and establish good practice in ICT usage. There is a plan to establish a National Backbone Computer Network (1997-2000). A committee addresses potential trade friction with countries such as the United States and regions such as the European Union as the country builds its capabilities to address external markets for ICT goods and services (National Computerisation Agency 1996).

### *Mexico*

The Instituto Nacional de Estadística Geografía e Informática is responsible for formulating national ICT policies. A strategy is in place to promote the development and use of these technologies which are regarded as a 'strategic factor' for development. Policies emphasise the uses of ICT and country-specific ways of integrating them within the economy and society. Emphasis is on active rather than reactive policies, fostering the initiatives of collaborative groups. ICTs are included in the Plan Nacional de Desarrollo 1995-2000 to ensure that the government will promote mechanisms to coordinate, develop, and supervise new initiatives at the national level (Guerra Benitez 1996).

### *Taiwan (Pr. China)*

A National Information Infrastructure Steering Committee was established in Taiwan (Pr. China) following recognition of the importance of ICTs for economic growth (Institute for Information Industry 1995). Government plans stress the role of ICTs in education and training, the exploitation of ICT applications, the promotion of computer literacy programmes, the development of a high capacity telecommunication network, and R&D in fields including distributed databases, electronic data interchange, and geographical information systems. Legislative measures are in preparation or under discussion, with respect to universal network access, equipment standards, intellectual property rights, and other areas. The aim is to support a competitive national information infrastructure that will contribute to human and cultural development.

### *South Africa, Viet Nam, and Ethiopia*

The ICT strategies in South Africa, Viet Nam, and Ethiopia represent cases of generic strategies to build capabilities for using ICTs but from extremely different starting points in terms of the capacity to attract investor interest.

### *South Africa*

The 1994 South Africa Reconstruction and Development Programme established ICTs as a high priority sector that should be closely linked with measures to meet the basic needs of the population.



*The use of information technology provides a major challenge in linking basic needs with information highways in innovative ways that improve the capacity of industry to successfully reintegrate into world markets. Southern Africa could lead the way in providing this link so vital to the developing world (South African Government 1994: 17).*

A 1996 White Paper on Science and Technology observed that South Africa needed a national policy to facilitate integration into the global information society (Hodge and Miller 1998 forthcoming). A research and technology foresight programme was introduced to help reach consensus among stakeholders and to ensure that national R&D policies would be aligned with the country's development goals. In the same year a Telecommunications Bill was passed establishing a Universal Service Agency to fund network access using revenues from the licence fees levied on the telecommunication operators. The Bill also outlined the conditions for phasing out the national public telecommunication operator's fixed line monopoly over the next six years. A National IT Forum has been launched to provide an ongoing forum for debate among representatives of government, the private sector, labour and community organisations, and the academic community.

### *Viet Nam*

A national programme for ICT development was initiated in 1993 in Viet Nam. It stressed the use of ICTs by government agencies as well as links between the development of ICTs and economic and social policies. A National Programme on Information Technology Steering Committee was established in 1994 and this led to the IT-2000 programme which emphasised education and training, R&D, and the development of a data communication network. Institutions and enterprises in all sectors are encouraged to participate and the programme provides a framework to coordinate activities between the Ministry of Science, Technology and Environment and other ministries such as the Ministry for Heavy Industry. The use of ICTs by the government and strengthening economic activities, skills, and R&D capabilities are stressed. A major goal is to produce hardware and software for the domestic market and subsequently for the world market. Tax incentives, investment assistance and shared cost schemes are under consideration to encourage the private sector which has been slow to promote the ICT sector. Policies and guidelines on foreign investment, technology transfer, and intellectual property rights protection also need to be strengthened (Dieu and Le 1995, Vietnamese Association for Computing 1994; Vu 1995).

### *Ethiopia*

The National Economic and Social Infrastructure Policy in Ethiopia emphasises the telecommunication infrastructure, and coverage in remote places. The science and technology policies for the agriculture, health, manufac-

turing, minerals, water, energy, and geo-information sectors acknowledge the importance of using ICTs to support information collection, analysis, and dissemination. A coherent approach taking account of basic infrastructure requirements and human resource needs, is required.

Many other developing countries are in the process of making fundamental changes to their national information infrastructures (Wilson 1996b). The changes involve cooperation between a wide range of individuals in the public and business sectors and new partnerships between these individuals, the non-governmental organisations (NGOs) that are becoming increasingly active in the ICT area, and between groups of citizens. As governments move to put new strategies in place they need to balance the conflicting priorities of these individuals and organisations. Among the most crucial issues are the dynamically changing relationships between:

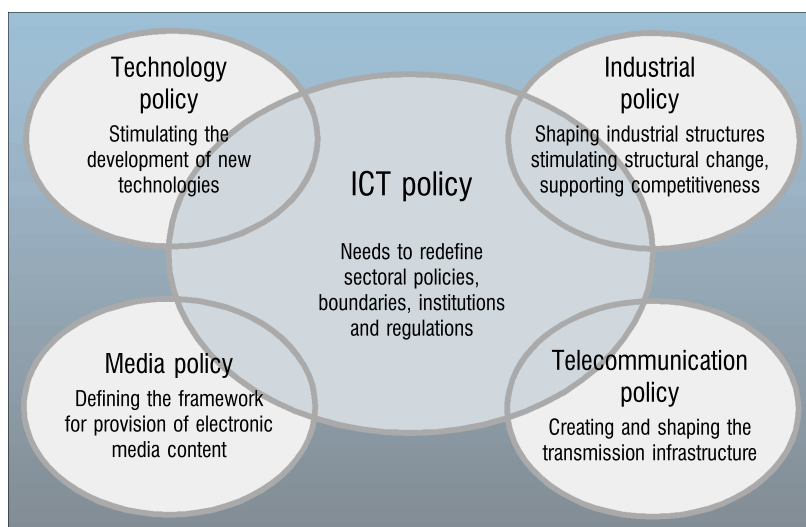
- public and private ownership and control;
- monopoly and competition;
- national and foreign enterprise ownership and control;
- strong regulatory procedures and the removal of controls;
- the introduction of sophisticated ICTs and programming or information content from abroad and measures to protect the national cultural heritage;
- measures to develop universal access to networks, and the role of financing to address a rapidly changing competitive market;
- intellectual property rights provisions to reward and protect the creators of content, and measures to encourage the use of intellectual property to educate and inform as many people as possible;
- the need to build indigenous scientific and technological capacity and technology and to attract the latest leading-edge technology from abroad.

Developing countries are in very different positions with regard to each of these issue areas. Some countries are taking measures to restructure their markets to promote ICT production capabilities while others are concentrating on export markets (Ramani 1998 forthcoming). Some countries are giving priority to capabilities for using ICTs while others are focusing on hardware and software production skills and training. Short-term priorities often mainly involve public and community services and strategic plans to attract foreign investors into the telecommunication sector. ICT strategies need to forge strong links between the ICT sector and development goals. This requires an integrated approach with broad participation by all stakeholders.

## 11.3 INTEGRATING NATIONAL ICT STRATEGIES

ICT policy overlaps with four well-established policy

FIGURE 11.1 – POLICIES FOR SHAPING INTEGRATED ICT STRUCTURE



fields: technology, industrial, telecommunication, and media policy (see Figure 11.1).

Technology policy tries to stimulate the economy by fostering innovation. Industrial policy is about growth and employment. It tries to stimulate the emergence of new industries in order to secure future growth. It often attempts to slow down the exit of firms from declining industries in order to protect jobs. Telecommunication policy seeks to secure the provision of communication services, and media policy provides the framework for the development of the audio-visual sector. With the convergence of ICTs, these separate policy domains are proving inadequate and it is not unusual for turf wars to hamper the formulation and implementation of new policies that cut across existing policy domains. Technology policies aimed at stimulating R&D have tended to target manufacturing technologies rather than services. The telecommunication equipment industry has been the concern of telecommunication, technology, and industrial policies but these are frequently not well coordinated.

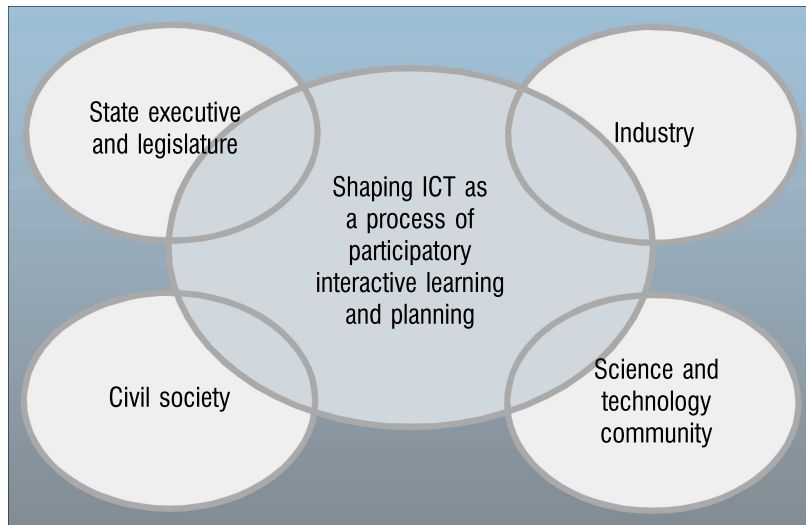
Many countries have separate ministries for technology, industry, telecommunication, and the media (Meyer-Stamer 1996). Restructuring to integrate existing ministries in order to bring competencies together is very difficult and can lead to an intensification of turf wars. Planning for the future of ICT development cannot be left entirely to the state or to the market. Neither approach on its own is politically acceptable or responsive to the emerging ICT 'paradigm' (Freeman 1987). An early failure to shape ICT development and use through the coordinated participation of all the stakeholders in government, industry, civil society, and the science and technology community, means that the trajectories of ICT development will become more entrenched.

Economic and social development involving the diffusion and use of ICTs is highly 'path dependent' (David 1975, 1985). Once a particular path of development of a software system, a telecommunication network, or an ICT-based process control technology has begun to gather momentum it can prove very resistant to radical changes in direction. This does not mean that there are no opportunities to shape the trajectory of ICT diffusion and use in developing countries. However, it does mean that the longer decision-makers delay the introduction of strategies that affect investment in ICTs, the more likely it is that particular designs and architectures of systems and applications will become fixed. This will make it more difficult to tailor ICT products and services to the specific needs of developing countries. A failure to take early steps using coordinated ICT strategies also increases the costs of shifting the trajectory of ICT development. A failure to shape the structure of ICT production and use, can severely restrict future policy options.

Technological innovation is not a once-and-for-all event. The innovation process in the ICT sector is continuous and it emerges as a result of interactive learning. During this process there are many 'degrees of freedom' and opportunities to shape the direction of the development of new ICT applications if the capabilities are available in the producer or user community (Mansell 1996c). If the ICT selection process is uncoordinated and anarchic, there is a risk that high costs will be incurred in terms of abandoned technological development paths and foregone opportunities for economic development.

National ICT strategies involving a process of participatory, interactive learning, and planning are emerging as an alternative to either state planning or market lotteries for constructing national information infrastructures. In

FIGURE 11.2 – ACTORS IN SHAPING INTEGRATED ICT STRUCTURE



fact, the development of large technical systems has rarely been left entirely to market forces. These developments have been shaped by political factors, for example, the post war experience in nuclear energy. However, in this case, and in other large system developments, the shaping of the technological trajectory involved a relatively small set of actors from certain branches of the state executive, industry, and science and technology. There was little direct involvement of citizens or other representatives of civil society. It is debatable whether it was sensible to leave these technology selection decisions to a limited set of actors in the light of their far-reaching consequences.

Very large ICT systems will facilitate, as well as constrain, the development of 'knowledge societies' for many decades to come. Opportunities to shape the trajectory of the development of this system in the developing countries can be created by involving a wide set of actors, and especially by including representatives of civil society (see Figure 11.2). Consensus conferences and future-oriented workshops are helpful in creating an environment for interactive learning involving actors from a country or region as well as international participants. These fora help to build bridges between the knowledge of people in existing ministries, the business sector, NGOs, labour organisations, etc.

Using new fora and other innovative legislative and regulatory instruments to create new coalitions of resources is preferable to leaving the trajectory of ICT diffusion to the market or to attempting to use a heavily centralised governance structure to direct the path of development. These approaches give rise to opportunities to establish new governance systems that are responsive to innovations in ICTs and to development priorities (Meyer-Stamer 1997).

Consideration can be given to people's expectations for the delivery of services, the plans and architectures for the delivery of transmission, switching, computing, and software with appropriate training, and whether to develop or reconfigure hardware and software in the national market or to 'buy in' products and systems from external sources. These opportunities can also create an environment for the ongoing assessment of people's information needs and their changing capacities to use electronic information and ICT applications effectively (Aksoy and Goddard 1990).

A better understanding of the role and impact of ICTs within specific development contexts is needed. A major ingredient for this is the presence of a mechanism for ongoing policy review, assessment, and monitoring (Akhtar 1995). To design and implement a national or regional ICT strategy requires consideration of several major issue areas. Guidelines can be followed to ensure that strategies are developed that help to harness ICTs to priorities for sustainable development. The next section highlights these areas, suggests guidelines for decision-makers, and illustrates what can be done to mobilise investment and expertise.

#### 11.4 GUIDELINES FOR NATIONAL ICT STRATEGIES

The United Nations Commission on Science and Technology for Development (UNCSTD) Working Group on IT and Development concluded that ICTs offer huge potential for creating economic and social benefits for all citizens. The application of these technologies also has the potential for widening the gap between the rich and the poor. If the benefits are to outweigh the risk of a widening gap, governments, the business sector, and civil society must work together. Key considerations in the

design and implementation of an ICT strategy include the following.

### *Producing and using ICTs for social and economic advantage*

Although there are risks, the production and use of ICTs can result in very considerable social and economic benefits. In order to avoid the risks, strategies need to create a dynamic relationship between the technological and human resources devoted to producing, maintaining, and using ICTs. The profiles of country strategies are likely to differ and the specific targets of national ICT strategies should be expected to change over time.

### *Developing human resources for effective national ICT strategies*

ICTs are changing rapidly and new applications are being created daily resulting in continuous change in skills requirements. Fortunately, these technologies also contribute new means of acquiring those skills. ICTs provide the means for enabling lifelong learning and for more widespread education which can lead to an improved quality of life. National ICT strategies need to encourage governments, businesses, and civil society to complement one another by using ICTs to enhance skills, formal education, and informal learning processes.

### *Managing ICTs for development*

The introduction of ICTs requires new forms of organisation. These organisational changes need to be identified and implemented by informed managers. People are needed who can act as intermediaries and who can coordinate, integrate, and disseminate information drawn from scientific and technical research, and practical experience about the production and use of ICTs. The management of ICTs for development demands people who are knowledgeable about the technical, social, and economic goals and a combination of ICT applications that support national development priorities.

### *Accessing ICT networks*

There are risks of social exclusion if businesses and citizens do not have access to an adequate national information infrastructure. Legislative and regulatory frameworks can help to promote the efficient use of private investment to extend and upgrade the national information infrastructure in line with development priorities. The national information infrastructure needs to be integrated with the emerging global information infrastructure in a way that maximises the benefits and minimises the risks. The design of the infrastructure also needs to encourage ICT development that is responsive to the needs of different groups, including the poorest sectors of the population and specific communities, such as women's groups.

### *Promoting and financing investment in ICTs*

Market mechanisms alone are unlikely to be sufficient to generate adequate financial resources to enable developing countries, and especially the least developed countries, to upgrade their national information infrastructures. Governments can experiment with two-way investment partnerships between local and foreign firms. The new ICT applications can generate positive spin-offs throughout the economy but this requires a coalition of resources from the public and business sectors. This mechanism could be more fully exploited by developing countries (UNCSTD 1997c).

### *Creating and accessing scientific and technical knowledge*

A failure to build a national information infrastructure is likely to handicap the scientific and technical research communities in developing countries. Capacity building involves the accumulation of scientific and technical knowledge to enable assessment, selection, application, adaptation, and development of ICTs so that they contribute to sustainable development. Expertise within, and external to, developing countries needs to be coordinated and strengthened. Improved 'early warning' of new technical, market, policy, and regulatory developments is feasible if networks of expertise are coordinated.

### *Monitoring and influencing the 'rules of the game'*

The international governance system for the global information infrastructure is strongly influenced by the governments and private sector stakeholders in the industrialised countries. The rules in areas such as standards, intellectual property rights, security, privacy, regulation, and trade are changing and they have important implications for the strategies adopted by developing countries. Developing countries need to share information and strengthen their participation (through national or regional fora) in establishing these rules. The new rules also need to be monitored so that steps can be taken to minimise any negative impacts they may have.

### *The Guidelines of the UNCSTD Working Group*

The UNCSTD Working Group on IT and Development generated a generic set of guidelines that can be used by national governments and other interested stakeholders to assist them in developing their own national ICT strategies. The guidelines and a summary of the conclusions and recommendations of the Working Group are included in Annex 3.

## 11.5 COALITIONS OF RESOURCES FOR BUILDING CAPABILITIES

In order to build a capability in ICTs and develop a national information infrastructure, developing countries will have to mobilise and pool large amounts of investment



and expertise. Action is required in three closely inter-related areas.

First, developing countries should seek to create a market-friendly environment (that is, one conducive to the regulatory and business environment) and to formulate an explicit national or regional ICT strategy. This involves providing a coherent framework that secures an efficient and a socially balanced allocation of scarce resources. Without this strategy, it will be very difficult to build powerful coalitions of resources for ICT sector producers and users or to mobilise substantial funds from international investors and financial institutions, and the donor community.

Second, it is necessary to ensure that any existing ICT strategy explicitly addresses the question of financing. There need to be operational guidelines on how to raise and combine public and private funds from domestic, regional, and international sources. Very few national ICT strategies meet this requirement. Finance strategies are needed to systematically explore possibilities of exploiting the principle of self-funding by building ICT projects into existing programmes and refocusing existing expenditure. Mechanisms for coping with initially high investment costs and foreign exchange constraints, and accommodating the needs of rural areas and non-commercial users in sectors such as education and health, are also needed.

Third, given the complexity of developing an ICT strategy and linking the question of financing to the process of planning and implementing the national information infrastructure, existing governance processes need to be reviewed and eventually adjusted. In line with initiatives in industrialised and newly industrialising countries, developing countries may seek to complement the market mechanism and decentralised decision-making structures with institutional frameworks that encourage participatory planning procedures.

If action is taken along these lines, there will be scope for even the least developed countries to build a capability in ICTs and develop a national information infrastructure. Financial resources and expertise have to be mobilised to:

- formulate a national ICT strategy and monitor its implementation
- build and operate the telecommunication infrastructure
- promote the production, maintenance, and development of ICTs
- promote computer literacy
- promote the application of ICTs in fields such as education, health, public sector management
- support the agriculture, the manufacturing, and natural resources industries, and the services sector.

Forming powerful coalitions of resources in these areas is not just a question of mobilising and pooling funds and

expertise. Building ICT capabilities also requires efficient utilisation and management of funds and intellectual resources. Guidelines for efficient use of financial resources, mobilising and attracting new resources, and managing the formation of new coalitions of resources are outlined below.

#### 11.5.1 GUIDELINES FOR SECURING EFFICIENT RESOURCE USE

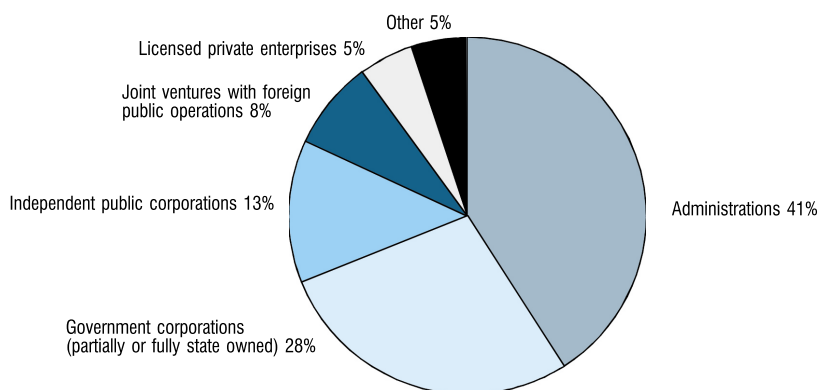
A market-friendly environment is the key to the rapid development of ICTs and the national information infrastructure. The infrastructure cannot be developed simply by adopting a market-driven approach. Given the existence of market failures and the need to combine efficiency and equity considerations, a national ICT strategy that complements the market mechanism is required. A strategy involving key decision-makers in the public and private sectors as well as users of ICTs might aim to achieve the following.

*Integration of development policies:* ICTs are a tool for the development of other social and economic sectors. They need to be planned and developed as an integral part of each country's overall development strategy (ITU 1995c).

*Building indigenous capabilities:* The ICT sector needs to be treated as a profit sector like other sectors in the economy. A strategy of building national (indigenous) capabilities can be based on a clear medium- to long-term vision. This vision should focus on the areas where indigenous capabilities are needed and on the hardware and software components and skills that must be imported. A failure to define national strengths and weaknesses in ICT production, maintenance, and development can result in overly import-dependent development. It can lead to lost opportunities to generate economic growth, export earnings, and jobs. Insufficient mastery of ICTs and a weak absorptive capacity for foreign technology can also result from a failure to build capabilities in key areas. Clearly justified 'make or buy' decisions are important for all countries and especially for the smaller and least developed economies.

*Balancing private profitability and social welfare:* Building a capability in ICTs requires a focus on businesses and user groups with sufficient ability to purchase products and services and the willingness to do so. An exclusive focus on commercial viability is unlikely to be sufficient for the promotion of social and economic development. ICTs are an important tool to increase the productivity of firms and of organisations providing social services such as education and health. ICT applications can also help to promote growth in remote areas. ICT applications should be addressed to the needs of sectors and regions where short-term financial returns on investment are low but the social welfare returns are high. Private profitability must be balanced against social welfare considerations to avoid the development of two-tier 'knowledge societies'

FIGURE 11.3 – AFRICA TELECOMMUNICATIONS OWNERSHIP

Source: *Communications International*, July 1996.

where the divisions between the ‘haves’ and ‘have nots’ are reinforced. In addition, building ‘knowledge societies’ is likely to involve cumulative effects and increasing returns that must be considered in the allocation of both private and social investment.

*Exploiting economies of scale and cooperation:* ICT systems generally are scalable offering scope for a step-by-step approach to building the national information infrastructure. However, an incremental approach to ICT development, production, or use may result in wasted resources. For example, if the telecommunication network is designed only from a national perspective, this may lead to higher costs than a design that is integrated with a regional, continent-wide, or international network. Regional and international cooperation may also result in cost effective solutions in the production of ICTs and in human resource development and R&D activities. Cooperation may also open up new possibilities for smaller countries.

*Emphasising economies of harmonisation:* The harmonisation of technical standards (network interfaces and protocols) is of critical importance for the rapid emergence of an efficient national information infrastructure. The potential of networks can be maximised when network interconnection and service interoperability are feasible for national, regional, and international services (OECD 1996b; UNECA 1996b). Interconnection and interoperability encourage competition and stimulate market growth by reducing transaction costs and allowing the exploitation of economies of scale and scope.

*Exploiting economies of joint use:* The investment costs of installation of networks may be shared by different user groups leading to a possible reduction in user charges when the network becomes operational. Savings can also be achieved by permitting the interconnection of private and public networks. The use of public access points, telekiosks, and multi-purpose telecentres are examples of ways in which economies of joint use can be exploited to

enable wider public access to the national information infrastructure at a reasonable cost.

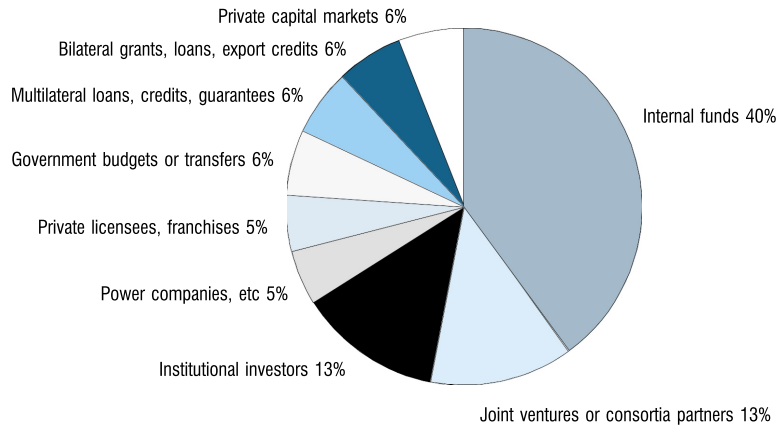
*Exploiting economies of joint production/economies of scope:* There is a potential for considerable savings if large scale investment programmes for the national information infrastructure can be linked to other major projects such as the construction of roads, railways, canals, or electricity links. The management skills for large scale projects are likely to be common to some extent, resulting in lower costs in this area as well as in construction of physical plant.

*Exploiting economies of coordination:* In the competition for finance and support, project proposers and funders often seek to preserve the specific technical characteristics of their projects. If similar projects are implemented using different technical standards, this is likely to dilute resources and reduce the funds available for better quality, self sustaining projects (Jensen 1996b). Project planners and sponsors need to cooperate to avoid developing competing and overlapping ICT projects.

## 11.5.2 GUIDELINES FOR MOBILISING AND ATTRACTING RESOURCES

Bold strategies for building a capability in ICTs set targets and define clear investment requirements (ITU 1995d). National ICT strategies should explicitly address questions of financing. Many ICT strategies consist mainly of a collection of principles. Figure 11.3 shows the ownership arrangements for public telecommunication operators in Africa in 1996. The number of joint ventures with foreign companies and private operators marks a change from the public monopoly ownership structure of the past. Figure 11.4 shows the diversity of sources of financing for infrastructure development that has occurred with the change in ownership structure. In this complex stakeholder environment general principles will not succeed in mobilising investment in the telecommunication or

FIGURE 11.4 – SOURCE OF INVESTMENT CAPITAL FOR INFRASTRUCTURE



Source: *Communications International*, July 1996.

other areas of the ICT sector. Success in mobilising and attracting resources will require very clear strategies.

The mobilisation and attraction of domestic and external financial resources necessary to ensure that ICT projects are financially sustainable may involve the following steps.

*Focusing on self-funded programmes or projects:* Programmes and projects in the ICT field should be based on the principle of self-funding whenever possible. They should be financed by user charges or by other mechanisms that generate a regular cash flow, for example, advertiser-supported models. In principle, revenues should be sufficient to cover getting-started investment requirements, maintenance, ongoing R&D, up-grading costs, debt servicing, and operating costs.

*Targeting commercial users:* Self-funding implies a focus on users with sufficient ability and willingness to pay for ICT products and services in the first instance. Users in sectors such as banking, insurance, trade, transport, tourism, and the media are likely to be able to afford the costs and be willing to pay for applications which are responsive to their requirements. Programmes aimed at broadening the market for commercial applications in the education sector, and for small- and medium-sized enterprises, and micro-enterprises, are very important in building the potential market.

*Accommodating commercial users in remote areas:* Self-funding is unlikely to be feasible for programmes and projects in rural and remote areas although there may be some users in these areas with the ability and willingness to pay for ICT products and services (World Bank 1994). The costs of building the 'last kilometre' of the national information infrastructure are high. This means that finance for the extension of services to remote areas must come from government sources or from the introduction of price structures that assume a contribution of revenues to the costs of network development in low density traffic

areas. For example, a (small) surcharge can be included in the prices for service in commercial centres with high traffic densities. Rapid advances in wireless communication technologies are likely to improve the prospects for building commercially viable infrastructures in remote areas using the self-funding principle.

*Accommodating non-commercial users:* In sectors such as health, education, government funded R&D, and government administration, the ability of users to pay for ICTs is very weak. There is a need to earmark adequate public funds to finance ICT use in these sectors and to attract financial resources from other domestic and foreign sources. To maintain financial requirements at realistic levels it is important to ensure that non-profit ICT users are organised and operate in a business-like manner (Jensen 1996b).

*Refocusing existing expenditure:* There are always competing claims on scarce resources and this is particularly so in the least developed countries. The potential for refocusing existing financial resources can be exploited by ensuring that public expenditure contributes to financing ICTs in targeted sectors and institutions including schools, universities, R&D centres, and government agencies.

*Building ICTs into existing programmes and projects:* Development programmes and projects often do not explicitly consider the benefits of the cost-effective use of ICTs. However, the absence of an adequate telecommunication infrastructure means that some basic needs projects in rural areas, and in sectors such as education and health, are limited in their use of ICTs (ITU 1995c). The feasibility of integrating ICTs into programmes for accelerating social, economic, and rural development should be explored systematically.

*Coping with high initial investment costs:* Prices charged to users are important in recovering investments and financing operating costs, but other sources of finance generally

are needed for projects involving high initial investment costs. The sources of funding that can be tapped and combined include: the profits of network operating companies, equipment supplier credits; loans from domestic, regional, and international financial institutions; domestic and foreign equity investment; medium- or long-term credit from national, regional and international venture capital funds for infrastructure development; public funds and domestic bonds; concessions from multilateral, regional, and bilateral donors; and grants from international donors especially for the least developed countries (ITU 1996a).

Innovative financing mechanisms such as build-operate-transfer (BOT) schemes have been implemented successfully in countries such as Thailand and Indonesia to extend rural telecommunication networks. Other financing schemes that may be feasible include build-operate-own (BOO), rehabilitate-operate-transfer (ROT) or build-lease-transfer (BLT) arrangements (ITU 1996b). Full use of a variety of financing mechanisms often requires the use of complementary instruments such as guarantees for investors and creditors covering commercial and political risk by national governments and international financial institutions.

*Coping with foreign exchange constraints:* If there is no local ICT production capacity the costs of imported components may be as much as 80 per cent of total investment costs for telecommunication infrastructure projects and comprise close to 100 per cent of the total project costs for components such as interactive terminal equipment, computers, or software. For developing countries with large trade deficits or weak international financial standing, the import costs of the information infrastructure will be prohibitive. There are no short-term solutions to overcome this constraint and the active involvement of the international donor community will be needed especially in the least developed countries for an extended period. During this period, these countries can begin implementing policies to attract foreign investors by introducing economic, structural, and regulatory reforms and begin to develop endogenous capabilities in targeted areas.

Although the resource requirements for building a capability in ICTs are large, a wide range of financial strategies and instruments can be combined drawing upon domestic, regional, and international resources to create powerful coalitions of resources for developing national information infrastructures.

### 11.5.3 GUIDELINES FOR MANAGING THE FORMATION OF COALITIONS OF RESOURCES

Mobilising and pooling resources for building capabilities in ICTs requires adequate management capabilities and decision-making processes. Neither a top-down nor a very decentralised approach to decision-making is likely

to be sufficient. Participatory planning procedures offer a promising approach to capability development in the management area.

In operational terms this approach may call for the establishment of a body (advisory council, national committee) at the highest political level to oversee the development of a coherent ICT strategy. Mission-oriented task forces in fields such as telecommunication infrastructure, computer literacy, and human resource development, and the application of ICTs, may also need to be established to act in an advisory or advocacy capacity, to provide guidance and coordination functions and need not necessarily replace existing decision-making processes. Government and public agencies, project managers, professional organisations, and financial institutions can participate, together with ICT user groups, to ensure that strategies and ICT programmes are responsive to development needs.

## 11.6 TAKING ACTION NOW

Developing countries need to develop their own strategies by drawing creatively on experience to configure their technical and human resources to invest in ICTs in a way that achieves the greatest social and economic benefits at the lowest cost. The preceding guidelines provide a framework for the issues that developing countries need to consider in formulating ICT strategies. Each society has its own distinct social and economic context. Therefore, the design of a new ICT strategy, or the improvement of an existing one, involves a distinctive learning process for domestic and other participants (Avgerou and Mulira 1996). This section outlines some practical steps that can be taken by policy-makers and business people in the short-term to minimise the risk of exclusion from the 'knowledge societies' of the future.<sup>2</sup>

### 11.6.1 MONITORING AND INFLUENCING THE GII

Given the importance of a systematic and integrated national ICT strategy, the many local, national, regional, and international organisations need improved coordination of their actions. Since these organisations have the capacity to advance or retard developing country interests, government officials need to maximise the interest of these organisations in their priority needs and to ensure that evolving strategies are consistent with development goals (Wilson 1996a,b). The measures that might be considered include:

- Assigning clear administrative responsibility for tracking key issues within the senior ranks of government.
- 'Mapping' the environment, and deciding which agencies will produce the most usable, relevant information about what a country needs, and then tracking developments in those organisations. Institutional monitoring needs can be given priorities so that some important agencies are covered very well, and others less so.

- Giving the responsible officials the necessary technical and material resources to gain full access to the global networks for ‘virtual participation’.
- Creating a ‘Virtual Forum’ of monitors who are assigned responsibility to track important global debates and developments occurring around the GII and its institutions, and to report on their relevance to developing countries.
- Pressing for greater coordination of current efforts to create regional marketing and information centres. These can be coordinated with other regional bodies, including non-telecommunication bodies.

#### 11.6.2 STEPS FOR MANAGERS IN DEVELOPING COUNTRIES

##### *Vision, leadership, and promoting organisational change*

The biggest ICT challenges that developing country governments face are not technical. The technology is available for most of what governments want to do (Wilson 1996b). The challenge, especially for the least developed countries, is to exercise vision and leadership and to promote organisational change. The most successful ICT producing and using countries are those best able to combine Vision-Leadership-Organisational Change to serve national interests. The least successful countries lack one, two or all three elements. Focusing only on the production or acquisition of technology is not sufficient. National and regional leaders must have a vision of ICT uses.

##### *Vision*

In the ICT sector the most practical step for a government is to create a vision – being visionary is practical in today’s rapidly changing world. ICTs can be put to many uses. Long-term vision is required to select the most important technologies and applications for a particular country. This requires a vision of the desired future, and a clear sense of how ICTs could serve that future and help to realise it. Visions must be strategic and have the capacity to recognise what can be changed and what cannot. Having a vision means being proactive, rather than reactive. Government decision-makers must believe that new things are possible, for example, that in today’s world comparative advantage actually can be created using ICT.

Developing a national vision involves setting clear priorities. The most difficult challenge for policy-makers in developing a positive forward-looking vision is to recognise that governments do not have all the answers. ICTs are mostly driven by private suppliers responding to private demands for goods and services.

##### *Leadership*

The essence of leadership means articulating the vision of

what ICTs can do, sharing that vision with others, and creating incentives that mobilise people to change their behaviour, in accordance with a shared vision, as they move toward their chosen futures. This means mobilising resources so people can adjust their vision, and develop new patterns of resources to meet new patterns of opportunities and challenges.

##### *Organisational change*

One of the greatest barriers to the successful development and application of ICT is organisational change. To achieve government vision and leadership requires the creation of an effective, flexible, and authoritative unit close to the top of government. This unit should be empowered to press these changes and to create opportunities for producers and users to offer and implement innovative products, services, and applications. A crucial barrier to diffusion is an organisation’s capacity to absorb a new technology. The introduction of hardware and software into a plant or office is relatively easy. Effective use of ICTs requires a profound transformation in the internal organisation of the firm and its interconnections with markets and suppliers. The successful absorption of ICTs requires technical capabilities and also effective planning and organisational capabilities (Hanna et al. 1995).

Decision-makers need to be able to address each of the following points and this requires substantial leadership and organisational change.

##### *Convergence and big disputes over the true meaning of ICTs*

In any revolution, there are always very serious and sustained conflicts over the meaning of the changes. Such conflicts occur within government between competing agencies, and between government and social groups, each seeking to impose its own interpretation. The stakes are high – new directions in public policy, professional status, and control of resources. The ‘ICT Revolution’ is no exception.

Such conflicts are inevitable because ICTs challenge the definition of the problem, who gets what resources to solve it, and whose career will be advanced. Most countries start the ICT revolution with a tendency to define the problem as entirely a telecommunication problem. Another misconception is to think the computer problem will be solved by placing cheap, stand-alone computers on desks in government departments. Better answers emerge through widespread discussions between governments, the private sector, and other stakeholders, and across government units. One description of the answer is convergence.

A truly national, visionary, and strategic perspective recognises that convergence unites telecommunication technologies, computers, and software to create networks that can enable citizens to be more knowledgeable, better



off financially, and better served by governments and firms, and to make their businesses more competitive internationally.

### *Government needs to learn to 'do new things' to 'win' globally and locally*

Being proactive in the face of the ICT revolution is essential. Governments need to make a proactive response to global information infrastructure–global information society developments. They should avoid excessive or heavy-handed interference in new ICT markets (OECD 1996b).

### *'The trillion dollar global deal'*

The 1997 basic telecommunication services agreement commits some developing countries to a major restructuring of their national telecommunication policies including ownership of facilities, access to networks, pro-competition regulatory policies, and national information infrastructure approaches. The outcome of these negotiations is intended to be technology-neutral. It is very important for officials in the least developed countries to understand this deal. These changes constitute a telecommunication strategy and a foreign investment strategy.

### *The least developed countries should not get too 'hyped up' about the ICT revolution*

Despite the sense of urgency, the least developed countries have the time to approach their visions and policies in a deliberate and careful manner. Government officials should beware of the hype. Success requires substantial organisational change, and because organisational change is very difficult, changes should be accomplished by careful thinking about financing and ICT policy. They should not be rushed. Much of the hype comes from self-interested vendors based in the industrialised countries and officials of the least developed countries should be especially wary.

Short-term expenditure on ICTs will compete with expenditure on other very important social needs such as transport and medical care. In the medium and long-term, investment in ICTs will contribute to expanding the coverage and quality of health care services and improving transport resulting in reduced competition for resources. That is little consolation for the official who must live in the short-term. In the short-term ICT expenditure may be a zero-sum affair.

### *The 'gap' - there is no 'convergence' on the horizon without action*

The prophets of the ICT revolution argue that a 'gap' between the information 'haves' and 'have nots' can be prevented. There already are huge gaps such as the GDP per capita 'gap' between most of the least developed countries and the industrialised countries. One study has

noted that at present rates of growth in the industrialised countries and Brazil, it will take about 487 years to close this gap (Pritchett 1996). At current rates of investment, it will take more than 50 years to close the existing telephone penetration 'gap'.

### *Identifying and measuring the right thing*

There are a variety of ways of mapping and measuring the quantitative and qualitative changes associated with the ICT revolution. Most experts believe they are incapable of capturing the wide range of services and products now available to developing countries. There is little agreement on what the new indicators should include. New metrics are needed for 'knowledge societies' that capture usage rates and the capacity to use ICTs effectively for development, rather than only the availability of hardware and services.

## 11.7 CONCLUSION - SUSTAINABLE DEVELOPMENT SHOULD BE THE GOAL

The goal of a national ICT strategy is to serve the consumer and citizen. What is good for them is good for everyone including the producers of the products and services. When competition is intense, investment should rise and prices should drop producing useful and desirable information. Decision-makers often slip into an overly technocratic approach that ignores the consumer and the citizen. Consumer 'demand pull' and citizen needs should be shaping the ICT revolution. Instead of beginning with the most sophisticated users, the strategies of national planners could be designed for women and for the marginalised people in urban areas and rural villages. If national ICT decision-makers were to gear deliberations toward what people in these areas need each morning when they rise, cook, want medical attention, seek crop prices, need weather forecasts, and seek education and jobs for their children, their ICT strategies would be more balanced.

The ICT revolution presents the least developed countries with a double challenge. They must assign qualified and able people to keep abreast of the latest developments in the ICT field while they assign scarce human, organisational, and financial resources to meet the needs of rural and marginalised people. Decision-makers who take the initiative to develop coherent guidelines for national or regional ICT strategies that reflect their development needs will take a major step toward building ICT capabilities that enable people to benefit from these technologies.



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## NOTES

- 1 *Based on ITU STARS Database (1996), three-year averages for 1990-92 and 1992-94.*
- 2 *The International Federation for Information Processing (IFIP) is a multinational federation of organisations with technical committees covering a broad range of computing themes like information systems, education, and communication. One of these deals with computers and society and its mandate is to collect, exchange, and disseminate experiences of developing countries and to develop criteria, methods, and guidelines for the design and implementation of culturally adapted information systems. A set of papers on these topics is published in Roche and Blaine (1996).*