

# INFORMATION AND COMMUNICATION TECHNOLOGY IMPERATIVES AND THE PUBLIC SERVICE

*M. Riaz Hamidullah\**

## Introduction

The role of technology in an economy and its associated impacts on society are recognized in numerous ways. But, 1970 onwards, such role and impacts have been more visible and intensely felt, particularly in context of 'Information and Communication Technologies' (ICTs). An increasing array of devices is now offered to people to facilitate their lives. So deep, wide and fast has been the spread of ICT and its impacts that an inevitable third industrial revolution has been on stream in consequence.<sup>1</sup> This third wave of revolution also focuses on technological progress as the third distinct engine of economic growth, besides the accumulation of physical and human capital.

Technological innovation is impacting conventional growth theory as well. The new school contests the old school in that an economy's growth is unlikely to spur merely if it accumulates substantial capital. Fundamental difference lies in : first, how that flow of capital - physical or human - is matched by the flow of innovations in the economy; second, these innovations are not generated by profit-seeking motivation beyond the economy. High savings and high investment ratios in an economy do not guarantee

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*\* Second Secretary, Permanent Mission of Bangladesh to the United Nations in New York.*

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higher economic growth. It's a third factor - productivity - brought about by scientific breakthroughs leading to technological innovations. But there is often substantial time-lag before the significance of productivity can be viewed and full potential of these inventions and innovations are realisable.

Given the recent experiences across countries, including Bangladesh, at various levels of development, the potential of "Information Technology" (IT) - as a source of economic growth and as an input to development - is increasingly recognized. First, it leads to new economic activities, high in value addition, viz. production of information technology goods and services. Second, it lends a strong impact on existing economic activities as it improves resource allocation and increases efficiency of producers in numerous ways, both in public and private sectors : (i) increase in labor productivity. (ii) increase in capital intensity, (iii) achievement of economies of scale, and (iv) creation of new economic structures. This is how ICTs are shaping a new kind of economy, e.g. information-based economy, often also termed as knowledge-based economy.

The main objectives of this article is to dissect the extent to which ICT has stretched out its thrust globally as well as the dimension of the post-ICT challenges for the public services in today's developing countries. The article consists of four main sections including this introductory one. Its second section describes the spread of ICT, its impacts and the challenges. The third section probes the responses of the public service and the post-ICT changing pattern of public service management, especially in developing countries like Bangladesh. Finally, the concluding section includes certain comments of the author.

## **The Spread of ICT and its Impacts and Challenges**

Impacts of ICT are now widely manifested in terms of knowledge and data flow in (i) commerce, (ii) education, (iii) social development, and (iv) governance. In all these areas forms and extent of ICT, however, vary. In the process, newer tools and modes are developed to deliver an increasingly wider array of goods and services to people. More importantly, these tools and modes are changing constantly. The Internet, conceived to be the vanguard of IT, primarily evolved in the 1960s to serve the US defense industry. In the 1980s, it spread over to the educational institutions and businesses in the US. Now, every business in the formal sector in developed economies is going online.

Developing economies are also following suit braving the differences in needed infrastructure which is most often substantial. Organized commerce in developing economies are experiencing the need to get into the 'virtual world' since never before could businesses across developing countries be accessible so conveniently and so quickly. Getting into the wired world means expansion of markets by leaps and bounds. The need may not be apparently pressing now, but in a few years large part of the organized commerce will be challenged making their presence in the 'real' vis-a-vis 'virtual' markets. So far, of all the sectors, 'financial services' appears to be the sector that perhaps has grown most rapidly driven by ICTs.

Even for low-income, rather undiversified economies, it can bring about quick and profound changes. Early results illustrate potential for visible increase in labor productivity and concurrently international competitiveness in goods and services they produce. Although it primarily applies to manufacturing where many processes have already been automated, substantial benefits can

also be expected in agriculture. Management of inputs or stocks can secure such benefits, for example.

**Impact within and beyond:** 'Information' is emerging as a new factor within the traditional production function, aside labor and capital. As an implication, instead of a material product being traded, it is increasingly the knowledge, or a new idea, itself being treated as a commodity in the market place - 'real' or 'virtual'. This marks a fundamental shift which is manifested by high growth in knowledge-intensive sectors of the global economy. Some effects of such-changes are evident by now, As an economy keeps on becoming a knowledge-based one, traditional sectors witness substantial restructuring. ICT-based products and processes get integrated into knowledge-based approaches and management. In the secondary sector, ICT-related hardware and software manufacturing are seen to dominate. At the final stage, entirely new products and services start emerging, which reshape tertiary sector.

In OECD countries, computers (both in terms of software and hardware) already contribute nearly 10% - 30% to their GDP growth. Such computer-induced growth has been much larger in the 1990s than in earlier decades. Investment in IT and growth in GDP per capita have been found to be strongly correlated in the largest economies - to an extent where impact of IT has been seen as large as the impact of the rest of the capital stock; although conversely, impact of IT is far less in the GDP of developing economies.

However, in aggregate, a concurrent shift is noticeable in the composition of GDP of OECD economies. More than 50% of GNP of major OECD economies is based on knowledge-centric activities. Although such a transition towards foot-loose, invisible

and flexible activities from physical, capital-centric activities remains a difficult proposition for many of the developing countries given competition for scarce resources, the fact remains that these are lending the high-income economies a rather different kind of shock-absorption capacity. A case to this point is the recent oil crisis and the subsequent response of OECD countries.

Irrespective of level of economic development of countries, application of ICT has been found impacting the political and social dimensions of development. Experiences in India, Bangladesh (e.g: Grameen Phone), South Africa, Mauritania, Brazil, Costa Rica illustrate ICT's contribution in enhancing participation of people in decision-making process at corporate, local and national level. By sufficiently reducing barriers, ICTs can give people wider access to markets for products and services they produce; spur people's initiatives giving them rapid access to markets beyond borders like worldwide web; allow interaction of diverse views and interests on social, economic and political issues facing communities. Governments can use ICTs to effectively manage decentralized governance at various levels of local government, for example.

Increased application of ICTs is also having an impact on distribution of production inputs, which changes conventional ways of doing business - be it in retail trade, or manufacturing. As a consequence, many of today's distributive layers or channels in production and distribution of inputs or outputs, or both, are becoming redundant. While many of the existing intermediaries are being replaced by new intermediaries, in net effect the efficient intermediaries rule. This trend is recasting the entire global market. In the near future, newer norms of conducting business-to-business relations are likely to be on demand as a result. In fact, this is an already felt need. Concomitantly will come the demand for newer

rules, regulations in global trading arena, particularly in the context of intellectual property rights. The distributive effect of such reconfiguration will affect developing and developed countries alike - perhaps the former group of countries most likely owing to their insufficient capability build-up and the growing presence of transnational corporations within their economies.

**Challenges to Seize Opportunities :** In spite of the new technologies' demonstrable benefits to countries, their emergence is empirically accompanied by varying levels of uncertainty and risk as well. The uncertainty or risk varies depending on the level of physical and socio-economic infrastructure in a State, its structure of governance, and level of inequality and homogeneity in the society. In sum, 'access' and 'availability' determines whether the new technology, or the new tool, would be a 'leveler' or 'divider' within a country-context.

Set on this premise, the question of greater use of ICT also faces challenges in a large number of developing countries. In the same way, developed countries are also concerned over the possibility of whether the spread of new technology would further increase disparity between the economically less fortunate people and the rich within their territories.

Gap in 'ICT use density' exists among and within countries. Available evidences suggest that a number of developing countries have progressed considerably, and are poised to progress further. Those developing countries have reached that height because of a sound interplay of (i) sustained high investment in social sector, particularly basic education; (ii) a consistent education system with good adaptability at primary, secondary and tertiary levels; and (iii) governmental support through a set of fiscal incentives and

physical infrastructure. India is one example of what such a supportive environment can achieve over several decades' time with appropriate and timely policy intervention.

Poverty still constitutes the central problem for majority of the countries of the world. This is one area where ICTs are challenged to address the various crosscutting issues. Although ICT's impacts over people are to be fully proven in respect of application of ICT in poverty reduction, a number of countries by way of their innovative approaches to poverty eradication suggest the potential of ICT at different levels in this regard.

Another challenge comes in the wake of a different wave of brain drain. This is a good possibility for countries as they start to embark on the ICT revolution when a sizeable portion of IT-skilled labor migrate to economically more advanced countries for better opportunities and higher earnings. Similarly, those developing countries at an advanced level of ICT use, such as India, are also challenged with possibilities to reverse the brain drain experienced at the early stage of development.

It is often argued that a very low level of income of the larger sections of population in most of the developing countries restricts wider use of ICTs. But an increasing number of country experiences suggest that once governments set in the required physical, legal environment, various forms of partnership - even with multilateral support - eventually emerge leading to quicker percolation of ICT-related facilities among the population. In many instances, a wider access in its wake has led to imaginative solutions to long-standing complex social problems as well. The governments are, therefore, also challenged to harness fuller benefits of ICTs so that within the crosscutting framework of

development, widespread benefits can be achieved. Irrespective of level of development, a State has an opportunity to leap-frog investing heavily in its human resources, particularly in basic education. Because property values have been de-materialized-a property is increasingly not assessed in terms of its 'protected value', but its 'knowledge-intensive value'.

'Governmental regulations' is often labeled as an issue in allowing or hindering spread of ICTs in developing countries. As a matter of fact, with spread of ICTs state oversight will be needed even more, perhaps in a totally new set of fields, and with new roles. But, government regulations do create problems where their application is time-consuming, or too much layered. That implies the need for governmental machinery to be familiarized and equipped with current complexities of the market situation and technology - both dominant and emerging ones - so that they possess sufficient flexibility to analyze which case borders at violation of an existing regulation and which do not. Increasingly governmental machinery will be called upon to promote healthy growth of ICT use within the country and curb unhealthy growth as well, where a fuller knowledge of the technologies on the part of the governmental authorities will be essential.

Fast spread of ICTs is altering forms of governance to commerce with digitization of information. It is adding up to convenience, economy and flexible management of complex business for governments, businesses and individuals. For larger entities like governments, or organizations (especially corporate ones), digitization of their operation extends their outreach. Governments can comfortably reach people across continents, and corporations their clientele. As commerce and more complex social

issues are coming within ICT's reach, technology is no longer be viewed as a stand-alone tool - singularly associated with the state's research & development capability.

Within the broad frame of a state's core goals to generate wealth (through employment generation and spearheading economic growth), eradicate poverty, increase trade, role of technology so far has not featured prominently till digital technology started to make available number of devices - ranging from consumer durables to utilities through management tools. Many of these devices (like personal computers) combine features that graduate these to rather management tools, and thus make them necessary tools for planners. Since their advent, rapidly these devices have graduated further - they are no longer considered 'necessary', rather 'essential' tools for myriad of purposes to planners and practitioners alike. There is a second dimension of this 'technology necessity' for development professionals - in public services or elsewhere. Imaginative and innovative handling of technology-related managerial problems, which in effect initially constituted critical challenges for many developing countries, are now being addressed through wider application of ICT.

ICT is no longer to be viewed as concentrating to immediate profit-minting sectors. Examples show its clear approach to social sectors. In its march to an 'Information Society', entrepreneurs and the industry are increasingly turning to social sectors in the developing world in an increasing intensity. To a good measure, however, it is borne by the realization that without social advancement, the new society cannot be sustained. Figure I illustrates some of ICT's impacts on public life.

**Fig. 1 : An Illustrative List of ICT's Impacts on Public Life**

Primary impact of application	Secondary impact
Expansion of service sector [Example: info-kiosks offering various facilities in Costa Rica, India - especially in Mumbai].	- Employment of recent graduates, in urban areas in particular; - reduction in dependence on investment based on resource endowment.
Wider online information access by rural communities to the full range of public services. [Example: in Bahia of Brazil rural people pay land and other local taxes through interactive PC work-stations].	- Quantitative and qualitative expansion of urban as well as rural growth centres; - containment of migration of educated labour to more urbanised growth centres.
Improvement in electoral process [Example: casting of electoral votes through a network of independent PCs].	- Enhancing collective power of voters: - empowerment of communities through election of right leadership; - reduced susceptibility to rigging notably in ballot-counting.
<b>Improvement in public sector administration</b> [Example: transparency in procurement process of public contracts like tender].	- Reduction in corruptive practices in procurement; - enhancement in public confidence.
<b>Improvement in delivery of public services</b> [Example: building tele-medicine and community health information system, periodic sharing of experiences and knowledge between rural and urban health practitioners]	
Improvement in mass education [Example: distance learning and online training].	-Building of a nationwide school network; -development of a network of library and information centres; -creating base for 'continuous education'.
<b>Improvement in national planning machinery</b> [Example: application of Geographic Information System (GIS) in Africa to gather investment data for production, maintenance and management of geospatial data].	- Better monitoring of development sectors, food situation, situation pertaining to ecology, land reform, settlement patterns, transport & communication infrastructure, health, education, energy, and tourism; - early detection of potentially hazardous environmental events using tele-monitoring,

## **Response of Public Service and Management of Change**

In the new economy, ICT would be one of the fast-evolving ingredients. In varying degree, State(s) will have to recognize other knowledge-centric sectors like bio-technology as well. However, coping with the new economy that follows Moore's Law, policy-makers are faced with a time which is characterized by three distinct features: (i) where 'speed' is of the essence in making information instantaneously accessible, rapidly transportable and simultaneously distributable; (ii) where 'innovative' ideas are essential determinant of domination; and (iii) where devices and managerial tools 'change rapidly'. These features are substantiated by a parallel feature - almost at the same time, while applying the existing technological devices and tools, applicants or users often have to apply a good measure of individual judgement. Clearly, straightjacket applications of technological devices are unexpected to yield solutions in required measure for complex, dynamic social issues. This characteristic of 'flexibility' is distinctive in the emerging knowledge-based economy.

Information and knowledge, as a net effect, are shrinking time, space and distance. Added to the prevailing division of labor - particularly at international level - it is bringing about new patterns of economic engagement and social interaction. New growth patterns are evolving which are naturally bringing about new patterns of economic engagement and social interaction. New growth patterns are evolving which are naturally bringing in thus far unknown products, jobs and livelihoods. With these features, networked economies are seeing a new class of workers emerging - i.e. 'knowledge workers'. One other important feature fast and eminently emerging out of the ICT revolution is that of pragmatic leadership. Indeed it is because of this leadership that some

countries are able to reap the ICT-related benefits, though others failing as well - as they cannot foresee forthcoming changes in different frontiers.

The new economy is leading countries to a new socio-political order. ICT-led technological advancements need to be seen beyond the surface. A number of myths have surfaced in developing societies. One of the myths claims that for developing countries ICT revolution widens the letter 'information haves' and 'info-have nots' since then cannot acquire the high-priced telecommunication technologies. And by the time they acquire one, it has already been replaced by a number of advanced versions of that technology. Hence, ICT is basically a technological problem. Similarly, another myth claims that if computers are placed at desktops of government offices, 'automation (or'computer') problem' will be solved.

But recent Asia-Pacific Development Centre (APDC) surveys show how in the Southeast Asian developing countries (particularly the 'tiger economies'), application of ICTs — both in public and private organization — have spread. It takes shape in distinct phases. At the initial stage, it is led by a small team of entrepreneurs. Afterwards, there is surge of private sector initiatives that encompass a large part of the economy. At that stage, government comes forward and networks its system with that of the private sector. Gradually the whole economy is netted. For an illustrative view as to how the Southeast Asian economies advanced towards e-Economy, see Figure—2.

**Fig. 2 : Way Southeast Asian Economies Advanced Towards e-Economy**

Major functions of ICT application	Elements	Impacts
Delivery of clerical service	Compilation of various uses : Population censuses, Livestock surveys, Company databases, Consumer price surveys, Crop reports, Trade and investment surveys. Periodic generation and reporting of high-volume transactions : Tax collection administration, Vehicle registration, Personnel administration and banking, Accounting & auditing administration. Office automation : Through word-processing and e-mail.	-Improvement in productivity of clerical work; -with reduced costs, increased speed. staff released for more productive use: -faster sharing of documents leading to speedy organisational decision-making,
Management services	Assisting corporate and government managers improve managerial capability: Applied in planning decisions, through Computer-Aided Designs (CAD) and Geographic Information System (GIS).	- Better control and planning: - testing decisions/results through experimental laboratory set-up [in macro-economic planning, models on investment decisions].
Public information disclosure and participation	Use in various procurement and other processes affecting/involving cross section people:	- A higher level of openness; - building of trust in and accountability to public about governmental actions.

Governance is shifting from 'ruling' to 'governing' affairs in a State. In the changing context, governmental organizations (GOs) have to take other actors, such as non-governmental organizations (NGOs), private business, academia, on board to perform many of their tasks. The resultant development is the emergence of a GO-NGO-Business centric broad partnership to attend to a select number of affairs of the State. This change will vary in depth and spread from country to country. But the fact that such affairs to be managed through a broad-based partnership need to be accepted widely. Moreover, on top of this shift, governments in a large

number of countries will need to shrink their presence in or withdraw themselves from a large number of the productive sectors, except for certain strategic sectors. So, the public service is demanded to be versatile, capable in determining (i) which are the areas where they should remain, (ii) at what level of development they should allow alliance-formation, and (iii) in what form they would allow such 'partnership formation'.

## **Concluding Comments**

Thanks to the dramatic advance of ICT which is sure to affect the various aspects of public life in most countries of modern world. The very concepts of organization and processes of management are already undergoing significant changes under the impact of ICT. More significant, however, will be its impact on administrative culture in most of today's developing countries. The fantastic advances made every day in ICT seem to have been a cultural shock to the typical administrators in some of the developing countries even at the threshold of the 21st Century. notwithstanding the fact that roughly a gap of half a century has already been created between the first appearance of some of the technological inventions in countries like the US and their adoption in many a developing country. So, countries like Bangladesh therefore have no option but to go by the imperative needs of the time, and see in particular that their public services undergo changes in the ways suggested below.

The public service needs to be more 'pro-active'. The public service should be made so capable so it be able to watch the trends. or the emerging trends - both within and beyond borders. Public policy should be drawn on a pro-active basis, not on reactive-basis. Actions need to be initiated reading the current and emerging trends in social, political, technological frontiers within and beyond state borders, and eventually make people aware of those trends, gradually frame policies to facilitate people to take concrete

initiatives. To reinforce this point, it should be noted that in 1997 when the countries signed the Agreement on Basic Telecommunications Services (BTA) - in a major post-GATT development - it was little anticipated how rapidly, irrespective of levels of development, new telecommunication technologies with falling tariff will be accessible to countries, particularly the developing countries. But few countries could seize the opportunities. Because it required an optimal mix of legal, fiscal and investment policy. However, responding quickly in the aftermath of that umbrella agreement, countries like Mali - with a per capita GNP of as low as US \$ 250 in 1998 - achieved in the years that followed impressive gains in social sectors through innovative application of ICTs.

Need to learn to do new things: Emergence of new technologies has turned the telecommunication services from providers to facilitators and regulators of such services. This necessitated a profound turn around in years of 'work culture' as well. In the role of regulator, public service will have to operate with a new set of rules.

Organizational change: Organizational structure of ministries, and entities below, naturally will need to be more agile, and demonstrate more adaptability to restructure process of interaction, decision-making within themselves. It would be important to have an built-in mechanism to continuously identify at which layer, what managerial changes could be made.

Needs assessment: It ranges from needs of personnel within a small division of a ministry to the needs of public which the small, invisible division within the larger set-up of the ministry can meet.

Continuous education: A process of learning and re-learning, which will go much beyond government's current scheme of periodic training of the civil servants, at different stages of their service life.

In the final analysis, the transition to a new system of economy and governance will not occur automatically. It will require a timely and optimal combination of vision, leadership, articulation of problems, consequent coherent strategisation and policy formulation, systemic planning and efficient implementation. The public service features within this set-up prominently, particularly in context of leadership. Within the growing concept of broad-based leadership, therefore, an effective response from public service can make significant difference. ,

## Notes

1. The first industrial revolution (1760-1840) being spearheaded by invention of steam power, and the second one (1890-1930) being by electricity, the current one (1970- ) is conceived of as being led by digital technology.
2. ICTs are generally defined as electronic means of capturing, processing, storing and communicating information, as well as the products and services that provide or support such services. In these ways it encompasses computer hardware and software, telecom equipment and electronically based industries and information application in all economic sectors.
3. Bernard Lanvin, *Building Confidence : Electronic Commerce and Development*, Geneva : UNCTAD, 2000.
4. Since 1973 high crude oil price led economic crises, considerable rise in oil price in international market was again witnessed - beginning from the second quarter of 1999 surpassing \$ 30/barrel. However, the industrialized economies could contain the vulnerability owing to a substantial presence of socio-economic factors since 1973, and most significantly productive activities that require smaller amounts of raw materials and energy per unit.
5. A large number of recent corporate mergers cutting across industries, particularly in media and entertainment are cases to this point. Mega-merger of firms like America Online - Netscape, MCI - Worldcom were substantially catalyzed by ICTs. While such mergers create larger financial base and help command a larger market share, more significantly these are reconfiguring the market contours by dissolution of contour lines between major service sector industries like media and entertainment, and leading to the possibility of emergence of an altogether new industry.

6. Speed of processor (data processing) will double in every 18 months.
7. Leadership is not always interpreted as the top political leadership. It rather encompasses the politico-bureaucratic layers involved in decision-making. It is clearly established in the Southeast Asian countries where public representatives and bureaucracy have worked mutually.
8. In Bangladesh, a misconception often prevails that if offices are provided with most recent versions of computers, government offices will be automated, and thus productivity will be enhanced. To the contrary, most of the desktop computers are largely used for word processing. The policy-makers, at the disposal of those desktop PCs, are often found unaware of, or not familiar with, the 'application software' that can be used for simple, smaller database building. This could be helpful in enhancing managerial proficiency, and thus productivity.
9. Many private initiatives are demonstrating strength of imaginative ideas. A multifaceted, non-commercial Internet portal [[www.oneworld.net](http://www.oneworld.net)] since 1995 has encompassed thousands of organizations and networks in developing world to monitor developmental issues. Massive networking has built in itself a database, and a public space on the Internet for civil society.
10. From the first generation of 'analog technology' in tele-com to the current 'digital technology', just in a decade's time countries are estimated to be reaching the third generation ICT milestone - where people will be using 'mobile internet devices' replacing e-commerce with m (mobile) - commerce. New devices will subsume many of the conventional functions like voice conversation in a single device, leading to disappearance of today's cell phones even. Obviously, that will raise daunting

technical, commercial and regulatory issues to resolve, particularly for governments.

11. Efficiency can be enhanced through small in-house steps which can be made without a macro overhauling of public service, including through enhanced capability of the public service commission.
12. To a large extent, public at large inquire about policy initiatives, grievance redressal. Even if a division is often not supposed to be discrete in these respects, some outlet could be provided, inter alia, through periodic interaction.
13. The concept of 'continuous education' goes beyond the in-service training or refresher courses of various duration. It is an evolving idea where executives are expected to engage themselves in a 'self-learning exercise' throughout their career - through degree or non-degree programmes - to consistently add value to their capabilities, which is subsequently rewarded at different stages of their service by the employer (State or otherwise) in recognition. For example, rapid changes in ICT is just one area that is challenging policy-makers' knowledge in framing policies, with evolving ways of business, education, administration, values, social norms. Most recent advances in de-coding of genetic technology will similarly challenge the policy-makers with newer set of issues involving legal and intellectual property protection, investment regime, etc. It is anticipated to bring about a rapid change in drug industry.

## REFERENCES

- Aspen Institute, 1999, *The Global Wave of Entrepreneurialism : Report of the 7th Annual Roundtable on Information Technology*. Washington, DC.
- Lanvin, Bernard, 2000, *Building Confidence : Electronic Commerce and Development*, Geneva: UNCTAD.
- Economic & Social Council, 2000, *Report of the High-level Panel of Experts on ICT* [[www.un.org/esa/coordination.html](http://www.un.org/esa/coordination.html)]. New York : United Nations. July.
- Economic & Social Council, April 2000, *Report of the Committee for Development Policy*. New York : United Nations.
- Economist.*, 1990, 'The Net Imperative : A Survey of Business and the Internet'. June 26.
- Friedman, Thomas, 2000, *Lexus and the Olive Tree*. New York : Anchor Books.
- Lewis, Peter H, 2000, 'Heading North to the wireless Future', *New York Times*. June 1.
- Mansell, Robin, (Ed), 1998, *Knowledge Societies : Information Technology for Sustainable Development*, New York : United Nations/Oxford University Press.
- Nishi, K. 1990, *Global Information for the Future*, Working Paper No. 23. Tokyo : Institute of Advanced Studies, United Nations University.
- Quah, Danny, 1999, *Development and International Cooperation in the 21st Century : the role of information technology in the context of knowledge-based global economy*. London : London School of Economics/Helsinki : United Nations University.

Smith, Gordon, (Ed), 2000, *Altered States : Globalization, Sovereignty and Governance*. Ottawa : International Development Research Centre.

UNESCO, 2000, *World Information and Communications Report 1999-2000*. Paris.

UNDP, 1999, *Human Development Report 1999*. New York : Oxford University Press.

United Nations, 1999, *Our Global Neighborhood : Report of the Commission on Global Governance*. New York : Oxford University Press.

United Nations, 2000, *We the Peoples : UN Secretary-General's Report before the Millennium Assembly*. New York : United Nations.