

ICTs for Development: Whither Developing Countries?

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doi: <https://doi.org/10.37745/ijliss.15/vol9n54252>

Published July 3 2023

Citation: Kargbo J.A. and Aureol M. (2023) ICTs for Development: Whither Developing Countries? *International Journal of Library and Information Science Studies*, Vol.9, No.5, pp.42-52

ABSTRACT: *ICTs have become a subject of great concern for developing countries if they are to achieve sustainable development. The rate of diffusion of scientific and technological innovation is determined by economic, social, cultural and political factors that are equally deep-rooted in developed and developing countries, but the obstacles encountered by developing countries in achieving scientific and technological progress are daunting. For developing countries, the crucial issue is not just scientific and technological innovation but also how to use it to improve the social and economic situation of their people for their health and welfare harmony with the environment. This article then critically looks at developing countries and the need to utilize ICTs in their developmental strives for socio-economic advancement. The article discusses the importance of ICTs in society, the nexus between ICTs and Telecommunications, use of ICTs for development, the challenges faced by developing countries in using these technologies, mitigating measures, the role of Governments in supporting ICTS and its implications for Aid Agencies*

KEYWORDS: information technology, informatics, informatics revolution, technological change, developing countries, third world, under-developed countries

INTRODUCTION

The celebrated seventeenth century science exponent, Francis Bacon, believed that the systematic cultivation of knowledge could place man in a position to recover dominion over the natural world and in so doing elevate him from brutal existence. Francis Bacon added that “knowledge is power” (*Nam et ipsa scientia potesta est*). This axiom is evident in the application of Information and Communication Technologies (ICTs) for socio-economic advancement in society. The pace of technological change in recent years has led to revolutionary changes in the processing and dissemination of data and to the emergence of an information society with immense effects on

production, service, cultural values, economic development, organization of labour, the environment and society as a whole. ICTs are the instruments which permit purposeful acquisition and application of information. They have opened up an expanding array of services which have created new business opportunities, boosted management and increased efficiency in production, productivity, innovation, Education and ecological balance (Unwin,2009). ICTs convey the notion of the application of modern technologies to information handling. Chief among these are data construction, Telecommunications, computers, semi-conductor electronics and software which allow computers to function according to predetermined instructions. These technologies are characterized by the fast pace of technological development; large capital costs; rapidly declining product costs; extensive global reach with expanding consumer markets. The main factors that have shaped global ICTs include economics of scale, close interaction among players in the industry, firms of different sizes playing complementary roles, development in Telecommunications and computing, and competition and cooperation.

In assessing the development and diffusion of ICTs globally three groups of countries are distinguishable namely: countries that are leaders in the field such as the Western World Powers; those where some capacity in the production and application of ICTs has been developed but still rely to a large extent on imports from the first group such as Asian and Latin American countries; and those where the application of ICTs is far behind the first and second groups and access to ICTs depends solely on imports such as African countries and some countries in the Middle East. The latter group and some countries in Latin America form the developing world in terms of socioeconomic advancement (Todaro,1994).

Also known as Third World Countries, developing countries are divided by the World Bank into four categories according to their per capita income levels namely low-income, middle-income, upper middle-income, and high-income economies. Most of these countries were at one time or the other colonies of West European countries such as Britain, France, Belgium, Germany, Spain, Portugal and Netherlands. Third World Countries are sometimes referred to as the “Fourth World” to underline their situation as the “poorest of the poor.” They share a set of common goals which include the reduction of poverty, inequality and unemployment, the provision of minimal levels of education, health, housing and food to every citizen, broadening economic and social opportunities, and the forging of a cohesive nation-state. Related to these economic, social and political goals are the common problems shared by these countries in varying degrees as noted by Todora (1994)

widespread and chronic absolute poverty; high and rising levels of unemployment; wide and growing disparities in the distribution of income; low and stagnating levels of agricultural productivity; sizeable and growing imbalances between urban and rural levels of living and economic opportunities; serious and worsening environmental decay; antiquated increasing and inappropriate educational and health

*services; severe balance of payments and international debt problems;
and substantial increasing dependence on foreign and often
inappropriate technology institutions and value systems (p.26).*

ICTs IN SOCIETY

The successful pursuit of economic and social development requires not only the formulation of appropriate strategies but also increased application of new scientific knowledge in the form of ICTs. ICTs are a set of scientific methods and modern technological tools used to organise and process information generated from diverse sectors of the economy and society. ICTs are essential infrastructure that enables firms, institutions and kinds of economic agents to share knowledge and collect, process and transmit information at breathtaking speed and at declining cost, thereby increasing productivity and improving quality and efficiency in all types of services. They enable the establishment of numerous databases at both national and international levels and provide linkages between them through networks. Technological change is acknowledged as a key source of industrial competitiveness and economic growth. ICTs have emerged as tools to manage logistical systems, the predecessors of growth. Today it is mainly their networking capability that has this important underpinning effect of driving the globalization of industries and services. ICTs offer a steadily expanding range of new services which have major economic consequences (Uwin,2009). Most developed and developing countries use ICTs in areas such as macroeconomic planning, health care, Education, conservation, commerce, management and administration. Some economic historians asserted that the impact of ICTs on society is tantamount to a “Second Industrial Revolution.” According to Anderson (1986) we have entered a structural global dimension which might be described as “Fourth Logistical Revolution.”

In manufacturing and agriculture the introduction of ICTs in designing, production processes and distribution of goods has resulted in a drastic fall in costs as well as improved technological performance. Recent advances in ICTs have also enabled transnational co-operations to transit technical and economic information at different geographical locations and involving widely dispersed industrial plants, thereby creating a symbiosis between development in the manufacturing and service sectors(Heeks,2007;Avgerou,2010).

ICTs have radically changed traditional trading as tenders and invoices initially sent by mail and facsimile are now sent via electronic mail, Internet and other forms of electronic communication. In Tourism and Hospitality institutions services are marketed using ICTs. Another area of local development is the use of Geographical Information Systems (GIS) in Land Surveys Departments of Government to assist in the systematic allocation of lands to farmers, rightful owners and other interested parties. Similarly ICTs offer a range of possibilities to improve production, education services, legislation enforcement as well as to maintain contact with the collaboration between countries. For the first time in recorded history developing countries have a convenient way to share resources and transfer knowledge to eradicate poverty and expand trade and business

opportunities. In this way new methods are found to foster development and ensure a more secure and peaceful world.

Management of the environment is another area mutually beneficial to both industrialized and developing countries and where the diffusion of ICTs has positive effects. ICTs enable the processing of a significant volume of scientific, social, geographic and demographic data. This potential, coupled with satellite imaging constitute a powerful tool for monitoring environmental degradation and the exploitation of natural resources. Recent advances in ICTs have enabled scientists to monitor global environmental phenomenon such as ozone depletion, drought, deforestation, desertification, land degradation and natural resources exploitation (Sahlfeld,2007). From the perspective of developing countries the positive aspects of ICTs are not only confined to the collation, packaging of information on the environment but extends to the organization and dissemination of this information in a form that meets the needs of users at different levels of development. Hanne and Dugonjic (1995) summarized the importance of ICTs as follows:

1. ICTs enable developing countries to participate in global trade and production.
2. They enhance managerial innovations and new business practices.
3. They help in alleviating poverty.
4. They are useful in the promotion of environmentally-friendly development.

In a similar vein Governments are now using ICTs to assist in the development, implementation and monitoring of policies, plans and programmes. The public sector carries myriad functions to include the provision of mass services to the public ranging from compilation of information to vote and the management of a country's economy. ICTs are essential to the security sector in combating crime, maintaining law and order and modern warfare. Governments now use ICTs to issue national identity cards and passports, registration of births and deaths, and other mandatory payments to health, production and security services.

ICTs and Telecommunications

There is a nexus between ICTs and Telecommunications. Both are growing revolutionary technologies and have developed with great rapidity with increased adoption in socio-economic ventures thereby facilitating employment and international competitiveness. They are essential platforms upon which other activities such as commerce are built. They facilitate the provision of timely information and strengthen mass communication. The combination of ICTs and Telecommunications has enhanced existing service industries and spun off numerous new ones. They have helped increase the productivity and efficiency of banking, business management, administration, education and health-care services. It is the marriage between ICTs and Telecommunications that has given meaning to global information networks and the development of Global Information Infrastructure (GII). They allow greater mobility in capital and financial movements and trans-border data flows. Both are enablers for the sustenance of democracy, which

critical factors include reasonable political participation, which in turn could lead to accountability of the leadership. This goal is promoted by the provision of opportunities and timely information to all parts of a country as well as by stimulation of the ability to exchange ideas. ICTs and Telecommunications provide a mechanism for the provision of timely information for administration. They provide a window to the rest of the world so that a country can compare its progress with developments in other parts of the world. As people discover what can be done elsewhere they become more demanding for accountability. ICTs and Telecommunications play a key role in developing a nation. They are widely used in many countries in areas of public health and tropical diseases control; they are valuable platforms for mobilizing international opinion regarding environmental issues, social concerns and crises. Developments in ICTs and Telecommunications have made distance irrelevant, thus enabling collaboration, cooperation and exchange of ideas, information and knowledge. The increase flexibility offered by these hybrid technologies has enabled major users of information processing to decentralize certain aspects of their operations within or across national boundaries.

That notwithstanding, the generation and diffusion of ICTs and Telecommunications in most developing countries contrasts sharply with that in industrialized economies and East Asian countries. Most developing countries suffer from a dearth of readily available reliable information with adverse consequences for achieving their numerous developmental objectives. Worst still the spread of ICTs and Telecommunications across all types of industries and services in industrialized countries is so fast and pervasive that developing countries find it difficult to compete internationally. With the scarcity of information in some developing countries, the diffusion of ICTs and Telecommunications could have positive effects on access to information. In industrialized countries electronic mail and networks have allowed users to obtain better access to data banks located nationally and internationally. These services are gradually making inroads into developing countries.

ICTs for Development

ICTs are key ingredients in organizational change, enabling new modalities of operations and relationships. In short ICTs are transformative technologies and messengers of change. They provide both tremendous opportunities for progress in the global economy, regions, countries, societies, cultures, communities, institutions and individuals, and challenges in such issues as equity, information policies, social inputs, employment, privacy and access. Faced with an ever-changing environment, countries more especially developing ones, need to examine these opportunities, challenges and risks carefully to establish strategies for the effective utilization of ICTs. In order for ICTs to be used to facilitate development there is need to keep on the “leading edge.” Countries must be able to anticipate technological trends, use imagination and work with the newest and best ICTs. To ensure this, researchers must be involved in experimenting new technologies and their application as early as is practical in their development. Where appropriate practical and result-oriented research must be supported, as opposed to theoretical or purely

academic; support activities must be based on identified user needs and technological opportunities. This will require linkages to other programmes and a multidisciplinary approach (Heeks,2002). Emphasis must be placed on generic or generalizable outputs of global interest. To this end the technologies must be linked to past investments in the information content of existing systems. Since ICTs are complex and fast-moving, countries and organisations need expertise in-house not only to provide good technical advice and assessment but also to interpret and understand the more specialized technical advice and assessments which they will have to obtain outside. There is also a need to develop country-capacity building through a mix of technology transfer, partnerships and local technology research and development programmes. Human institutional resources in the area of ICTs research must be strengthened through International collaboration (Unwin,2009). Countries and organisations must support policy research which can provide important framework for decision making and allocation of resources. They must encourage sensitization, evaluation and dissemination activities which are vital to ensure support for ICTs research and the effective utilization of research results.

ICTs Challenges

A number of challenges impede the diffusion of ICTs in developing countries. Foremost is the lack of supporting technical infrastructure ICTs which have certain inherent properties that make diffusion processes sensitive to some aspects of public policy in particular. The spread of ICTs hinges crucially on well-developed and highly reliable energy distribution systems and Telecommunication technologies which are lacking in developing countries. Second ICTs depend on skills to operate the system, be it hospital diagnostic centre , machines in industrial workshops, airline reservation systems, library systems, teleconferencing systems, word processes, spreadsheet programmes or flight simulation games. Developing countries need to commit a critical mass of human and capital resources to ICTs in order to exploit the benefits of these technologies. Further there is lack of awareness of the potential benefits of ICTs in most developing countries. This is particularly true of small and medium-sized enterprises and low tech traditional sectors. Perhaps an even more crucial challenge is organizational units' capacity to absorb ICTs. Effective use of ICTs involves much more than the introduction of hardware, software and digital equipment into a plant or office. It requires profound transformation in the internal organization of the firm and its interconnections with markets and supplies. The successful absorption of ICTs thus, requires not just technical capabilities but also effective planning and organisational capabilities.

Two major challenges faced by developing countries hinder the growth of ICTs: the lack of a market economy and weak infrastructure. Developing countries still lack viable information systems particularly at governmental level. And without such systems productivity, trade and scientific research will be grossly affected. Besides in most developing countries there is a handful of ICTs professionals with minimum guidance. These specialists are not given sufficient support and encouragement to pursue the work in this field; the supply of equipment and publications on

the field is inadequate. Developing countries have very few research institutions dedicated to ICTs. These research institutions have weak links to industry. University response to fast changing technology is rather slow. Private educational and training institutions have inadequate standards. Other institutions for technology information, technology assessment, and quality assurance are either nonexistent or weak. In-depth research in this field is limited by inadequate facilities and lack of up-to-date scientific publications (Dijk, 2005). What is more computers and their technology are also leading to cultural change? English is their predominant language. This poses problems in certain developing countries where English is neither used nor taught.

Most ICTs-related services in developing countries such as software development, information services, and other related products and support services are small scale. In addition, they operate in fast-changing, high-risk, high-payoff niche markets. Due to these features and also to weak and underdeveloped financial markets, firms using ICTs find it difficult to finance investment in modernization and training by borrowing against potential future benefits. Other significant challenges are lack of user-producer networks, up-to-date know-how, lack of domestic demand and ability to absorb imported technology and lack of technical and managerial capabilities.

There is also the proliferation of standards challenge. Multiplicity of standards are compounded by the rapid rate of obsolescence due to technical changes and the investment involved in support services. Further the infringement of intellectual property rights, the high cost of energy, low capacity of the power-generation infrastructure and the poor maintenance of power supply systems are major impediments to the application and diffusion of ICTs in a number of developing countries.

Mitigating Measures

If developing countries are to improve the quality and effectiveness of state management, production, trade and services sector ICTs must be developed in every sector. Developing countries need to import the fastest technology from abroad in order not to fall too far behind. Skilled labour force that can carry out in-country research and engage in cooperative research programmes with foreign countries will be necessary. Developing countries should expand ICTs facilities to the “open system” concept whereby systems and products are made compatible. They should establish a firm foundation for information infrastructure that will meet the basic information needs of state management and socio-economic activities. Computer system and communication facilities should be developed into integrated networks with software information systems and databases serving the needs of state management and the economy. Developing countries should popularize an “information culture” that could help create an “information society.” Full use should be made of all opportunities to transfer technology that could assist establishments producing modern computer equipment and components (Giugale,2014).

In order to promote accurate and timely information that will satisfy the needs of states in terms of decision-making and governing, state level projects such as information systems for government administration should be set up. Integrated economic information systems and information systems on services technology, national resources and the environment should be implemented. Similar projects are needed to keep track of finance, banking and market transaction and import-export performance.

For successful ICTs development contingents of qualified professionals need to be formally trained. ICTs education should be encouraged in primary and secondary schools and general information on the subject disseminated country-wide. Research should be conducted on how to apply ICTs in Education and training. Faculties and departments of ICTs should be set up in tertiary and higher education institutions for specialist training. Developing countries should aim at acquiring up-to-date knowledge such as gaining insights into world-wide technological trends. Research should be conducted, systems designed, and software developed and applied for ICTs projects. Policies should be introduced to encourage the setting up of ICTs Research and Development Units in different branches and organisations of the economic sector. Effort should be made to provide software for domestic ICTs markets. This could strengthen the information service networks. To meet the needs of domestic ICTs markets, developing countries should link their domestic information networks with regional and international information Telecommunications networks. In all these moves policies and principal measures should be put in place to ensure standardization in terms of information networks across Government Ministries, Departments and Agencies. Developing countries should facilitate the importation of ICTs equipment, encourage information exchange and production, technology utilization of foreign consultants and expertise of their indigenes living overseas to invest in ICTs (Avgerou,2010; Loy, 2013).

Getting ICTs development underway requires funding. Governments should provide funds for key projects and programmes. They should organise and fund business and investment to form ICTs infrastructure with their Ministries of Education, Finance, Trade, Science and Technology and State Planning Committees and Central Banks playing key role.

What Role for Governments?

Governments in developing countries are major users of ICTs owing to their large share of national investment. Hence, their procurement and investment practices have a role and influence on the development of the domestic market, competitiveness and the national information infrastructure. Governments should be acting through standardization, Telecommunications regulations, public information sharing policies, and the legal framework for intellectual property rights. Privacy and electronic based transactions can shape the ICTs industry in the right way. Governments' support is crucial for increasing access to information technology, technological information and transfer, education and training. As users, central and local governments can exert significant influence in

promoting good procurement practices and the development of competitive markets. Governments can significantly influence information infrastructure through standardization, legal frameworks for intellectual property and electronic-based transactions, and public information-sharing policies.

The reliability and flexibility of Telecommunications and power infrastructure are key to success in the broad application of ICTs. The role of private investors and entrepreneurs in these sectors need to be emphasized at an early stage. Local and central governments should also device incentive schemes and programmes for the development of small and medium-sized enterprises, educational training, and Research and Development Institutes to upgrade information services. Governments should interact intensively with the private sector, trade associations, universities, research institutions and professional associations to make the ICTs sector vibrant and innovative. Cooperative research programmes, information networks and collective efforts would not only economize on resources, but also develop human resources and technology. Governments should be dynamic and flexible in adopting to changing and growing needs. Private and user organisations should be involved at an early stage in the formulation and implementation of strategy (Unwin,2009).

Governments should consider creating responsive institutions to deliver information and support services, and to facilitate capability formation where market forces are deficient. This is particularly important for SME users and software/information service providers. Concerted efforts are needed to raise awareness of public and private executives regarding the enabling opportunities of ICTs and the demanding requirements for managing ICTs-induced organizational changes. For successful ICTS development and diffusion Governments should ensure that an Integrated National Technology Planning and Policy Making Framework be provided to address country-specific national goals and integrate ICTs with important economic sectors and activities at all levels. It is this integration with other economic activities, along with the widespread use of computers to enhance productivity and the quality of services and products that will ensure the success of the Strategic ICTs National Policy. This policy would not only coordinate investments in ICTs projects but would also consider developments of incentives and institutions to supply the necessary informatics personnel and research capabilities. It should ensure that the information infrastructure services with “public good” characteristics are sufficiently produced through public-private cooperation and co-ordination. In determining this policy, the role of the Government and private sector in developing ICTs sector should be clearly defined. Early involvement of private sector and user organisations in the formulation and implementation of strategy will help to accomplish the desired results. The policy should be timed and tailored to the level of economic and industrial development. It should vary according to technological capability (ICTs supply) and domestic market potential (ICTs demand). Using the measures derived from national goals, the ICTs policy should be subjected to periodic evaluation and this feedback may be used to update the policy framework and implementation (Heeks,2002).

Implications for Aid Agencies

Governments' support to ICTs has implications for Aid Agencies. These Agencies should move beyond assistance to ICTs components of investments projects. They should assist Governments to become effective ICTs users, build local competencies to formulate Strategic National ICTs Policies and act as catalysts for ICTs throughout the economy. In particular Aid Agencies should advise Governments on strategic implications of ICTs for key sectors such as trade, manufacturing, logistics and education. They should facilitate the recruitment of ICT multinationals for potential partners in developing countries. Key aims would be to: build channels and technological transfer; develop access to export markets for local ICTs producers; ensure access to advanced applications for local ICTs users; and provide demonstration effects and exposure to international best practices in ICTs production and use. Aid Agencies should improve the capabilities of Governments as users of ICTs and managers of public information resources. They should assist public and private agencies to collaborate in the design and implementation of ICTs diffusion programmes to improve the competencies of private enterprises. Above all Aid Agencies should assist in developing public policies and infrastructural strategies that could support the diffusion of ICTs and build links between ICTs producers and users.

CONCLUSION

ICTs can be applied to every conceivable activity from collecting taxes to bank management; from petroleum exploration to energy efficiency systems; from commerce to environmental management; from publishing to transportation; from entertainment to communication; and from document management to complex scientific, technical educational requirement and academic. In developing countries some of the benefits offered by these technologies are automation of processes, accurate information storage and retrieval, computer-aided design and manufacturing, fast communication capabilities, improved productivity and quality competitive advantage. However, as the pace of world-wide economic activity speeds up and becomes ever more globalized, the issue of access to and utilization of, ICTs in developing countries governs their survival. Without appropriate adoption, adaptation, transfer, development and use of ICTs, developing countries will continue to participate in the global economy from an uncompetitive position and their disenfranchisement will increase. Faced with an ever-changing environment developing countries need to examine these opportunities and risks carefully and establish strategies for the effective use of ICTs. Developing countries need to commit a critical mass of human and capital resources to the development of ICTs in order to exploit their benefits. The challenge for those truly interested in sustainable and equitable development of developing countries is to close this ever-widening ICTs gap.

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